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How the Blanking Process Is Used To Make a Sheet Metal Sleeve

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The four operations necessary—Making the die oversize
How the blanking die operates—Designing the piercing die stripper and punch pad—Two forming dies are used

THE PART WHICH is to be manufactured by the dies shown in the accompanying illustrations is one whose general form is often met with in sheet-metal work, and the four dies used in its manufacture bring out many good features of die design. When dies are designed for parts requiring several operations, a number of facts should be taken into

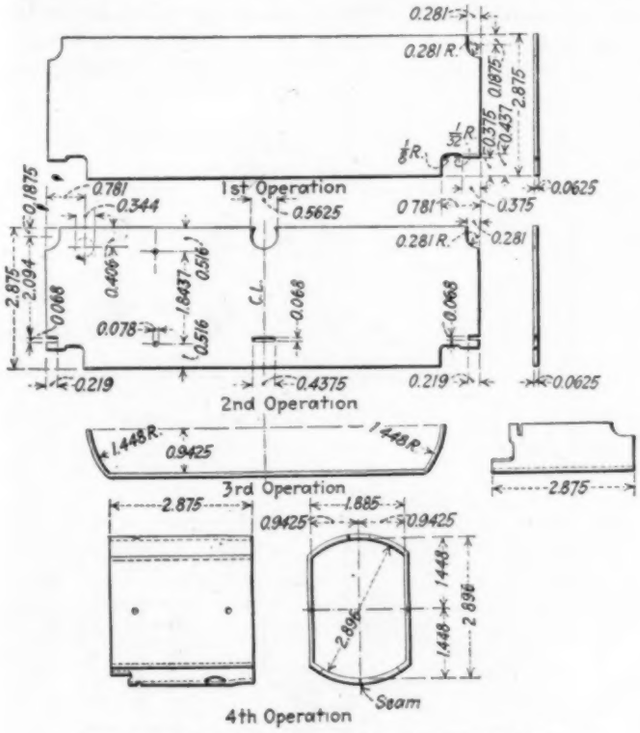


FIG. 1—LAYOUT OF THE FOUR OPERATIONS

account, namely, the accuracy required, the quantity of production, the production cost versus the tool cost, and the forming possibilities. This last item often determines the method of procedure, especially so if there are several forming operations.

After laying out several methods with the before-mentioned points in mind, the following method of manufacture was decided upon: (1) To blank a flat blank, its corners so shaped as to produce the desired openings along the seam in the bottom of the formed part; (2) To pierce the remainder of the holes in the part; (3) To form up the ends for the lower radius; (4) To form the upper radius, thereby closing the blank and making the completed part. In. Fig. 1 is shown this layout of operations.

In the manufacture of the part shown in Fig. 2 extreme accuracy is required only as to length and squareness of the ends. The length is determined by the blanking die. The width of the blank becomes the length of the formed part. By the two forming dies the squareness of the ends is determined.

In order to get the ends square and the blank to the exact length, it was decided to blank the part from flat stock and form it. This plan also kept down the price of the material used. By so doing it was also

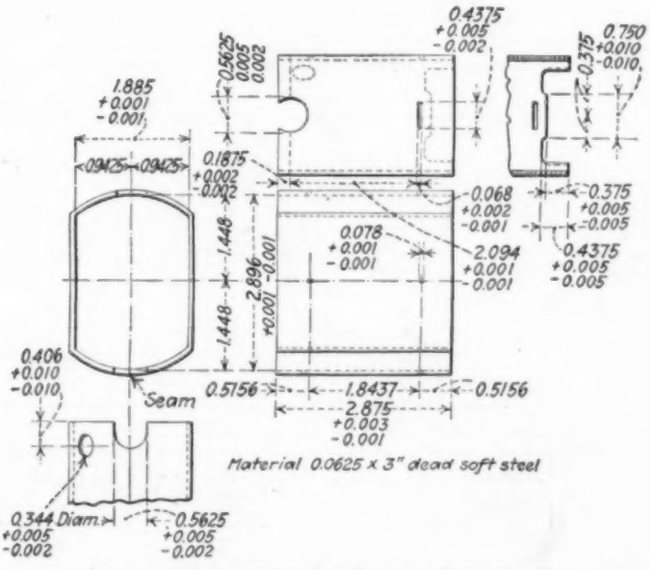


FIG. 2—THE PART TO BE MANUFACTURED

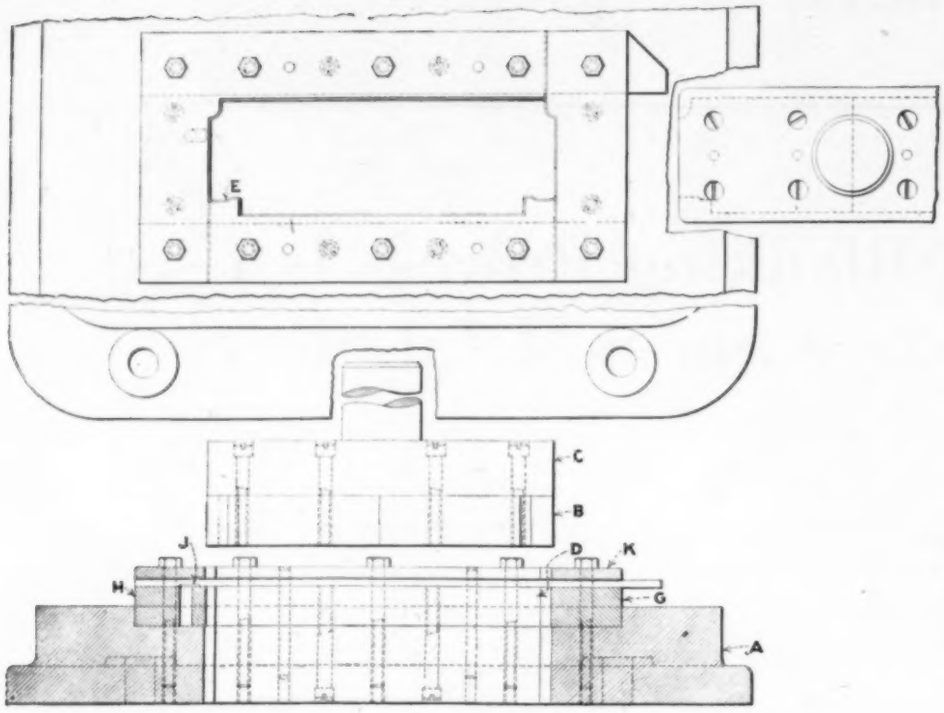


FIG. 3—THE BLANKING DIE FOR THE FIRST OPERATION

possible to get the sides of the blank parallel and straight without a trimming operation, which would be necessary if the part had been drawn. The piercing of the holes was also made easier by this process, as they could be pierced in the flat blank. In order to pierce these holes in a formed part, a costly and complicated piercing die would have been required.

The two forming dies were built first, so that the length of the flat blank could be accurately determined by experiment from them, and the proper allowances made for bending the stock over the corners and for possible stretching. It was afterwards found, however, that no stretching took place.

The blanking die shown in Fig. 3 is a sectional die built up of four pieces, and set into a semi-steel die shoe *A*. The punch, which is made of two pieces *B*, is set on a semi-steel punch holder *C*. It should be noted that the side pieces *D* and *E* of the die are set inside the end pieces *G* and *H*. This arrangement makes the side pieces shorter, and, therefore, easier to make and harden. The punch is built in two pieces for the same reasons. In cases of this kind it is generally advisable to make the parts of the die larger than at first thought necessary, as afterwards they are easily made smaller, but not larger.

Owing to the size and length of the blank, the die is given a double shear and has a total cutting edge of approximately 24 in. The holes along the seam in the bottom of the part are made by so shaping the corners of the flat blank that when it is completely formed and

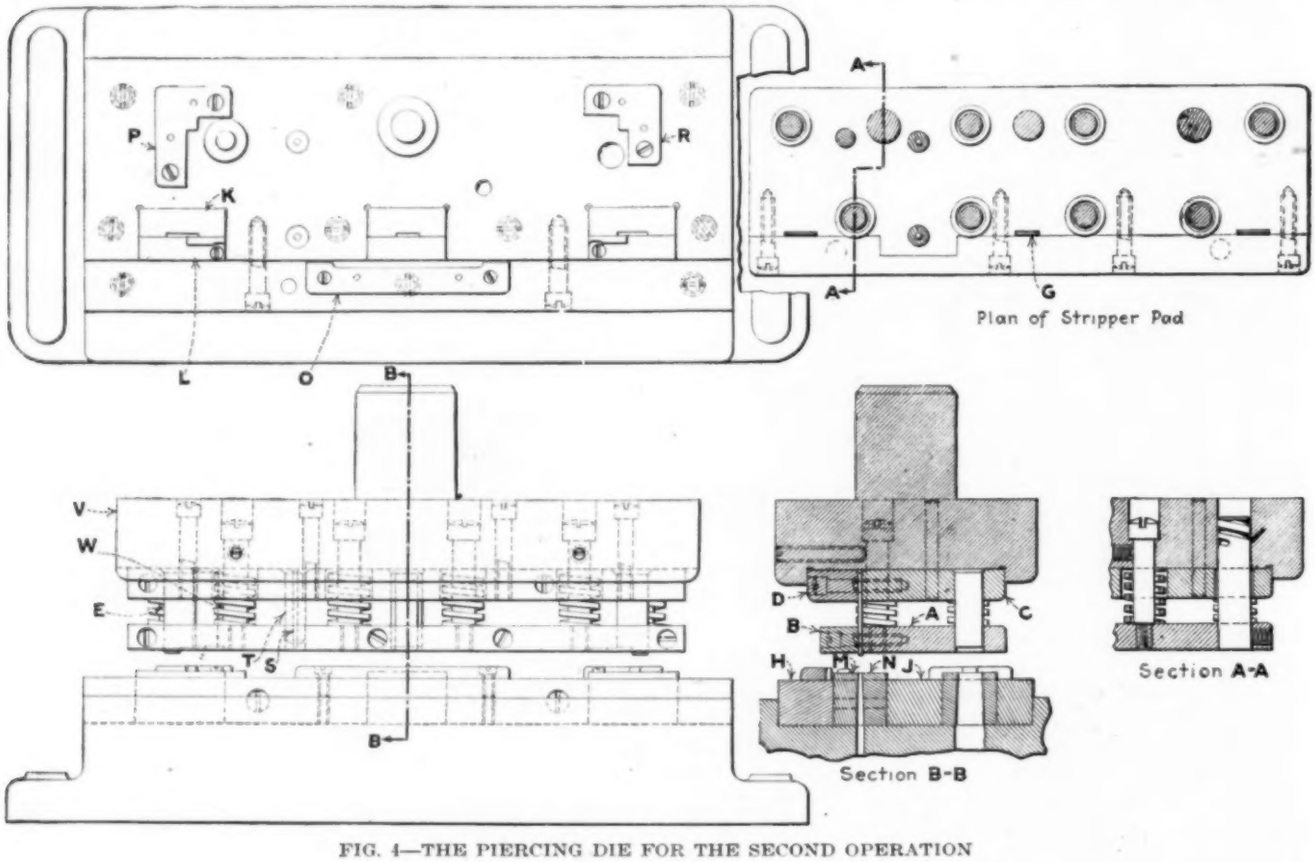


FIG. 4—THE PIERCING DIE FOR THE SECOND OPERATION

the two ends brought together the four corner notches make the two desired openings. This plan also means that there are several less punches to be kept up in the piercing die. The pin *J*, which is used for stopping the stock when feeding the strip, is a standard stop pin with a flat head approximately the thickness of the stock. Enough room is allowed under the stripper *K* to permit the stock to rise up with the punch high enough so that when it is stripped off the pressure of the operator's hand will cause the fin between blank openings to land on the head of the pin and slide over ready for the next blank.

The stripper plate is also built up similar to the die and is held in place by capscrews which pass through the dieblocks and are threaded into the die shoe. The fillister-head screws which fasten the dieblocks to the die shoe are used to hold the blocks in place when the stripper has been removed for grinding or other purposes.

The Piercing Die With Strippers and Punch Pad

For the second operation is designed the piercing die illustrated in Fig. 4. This die is also a sectional die with a built up stripper *A* and *B* and a punch pad *C* and *D*. The punch pad and stripper are each made in two pieces. They are so pieced together that the slots for the slotting punches *E* and *G* can be easily milled or shaped out. The dieblock at *H* and *J* is similarly built up so that the openings for the hardened steel slotting inserts *K*, *L*, *M* and *N*, can be milled. Hardened steel inserts are used wherever a hole is pierced. The dieblock proper is made of soft cold-rolled steel. The inserts can be round bushings where a round hole is being pierced. In the case of the three slots they are made of two pieces so that the opening for piercing can be milled.

The complete opening is made in one block of each pair and the three sides have draft. The other block of each pair is made straight as is the face of the first block in section *B-B*. This method has been followed in order that an opening should not appear where the two pieces butt together when the block is ground down in sharpening. If this precaution were not taken the stock would tear in the open corner. The inserts are all made so that they protrude ⅛ in. above the surface of the dieblock. In this way they can be ground quite a few times before the top surface of the block is reached. By this time the inserts will be oversize and can be replaced.

The nests *O*, *P* and *R* for locating the blank are set on the dieblock. By so doing the dieblock forms a complete unit in itself, which can then be set on the shoe. The punches are all straight. The two small ones *S* which are 0.078 in. in diameter are set in sleeves *T* to strengthen them and prevent them from slipping on the stock and shearing the die. All the punches are a sliding fit in the stripper.

The stripper pad is guided by two pins which slide up and down in the punch holder *V*. These guide pins are a tight fit in the stripper pad *A*, and are also held by set screws. Shoulder screws *W* which are threaded tight in the stripper and slide up and down in the punch holder, limit the downward motion of the stripper. The shoulder screws are encircled by pressure springs which place the stripper pad under pressure. In setting up the die the stripper pad is forced up and the shoulder screws are then locked by set screws set in the punch holder *V*. In this way the punches are exposed while the die is being set up in the press.

This general construction was necessary owing to the smallness of the punches, the stock being 0.062 in. thick and the slotting punches *E* and *G* 0.066 in. wide. By this method of construction the punches are supported as close to the stock to be pierced as it is possible to get, thus preventing any chance of the punches slipping on the stock and shearing the die. When the punch comes down the stripper strikes the stock first and holds it tight against the inserts while it is being pierced. The slotting punches *E* for the two slots in the edge of each end of the blank have heels which enter the die insert in advance and protect them from slipping.

The first form, shown in Fig. 5, consists of forming up each end of the flat blank so that said ends each form one-half of the bottom of the finished part. The blank is laid on the pressure pad *A* and between gages *B*. The pin *C* serves to centralize the blank, and the

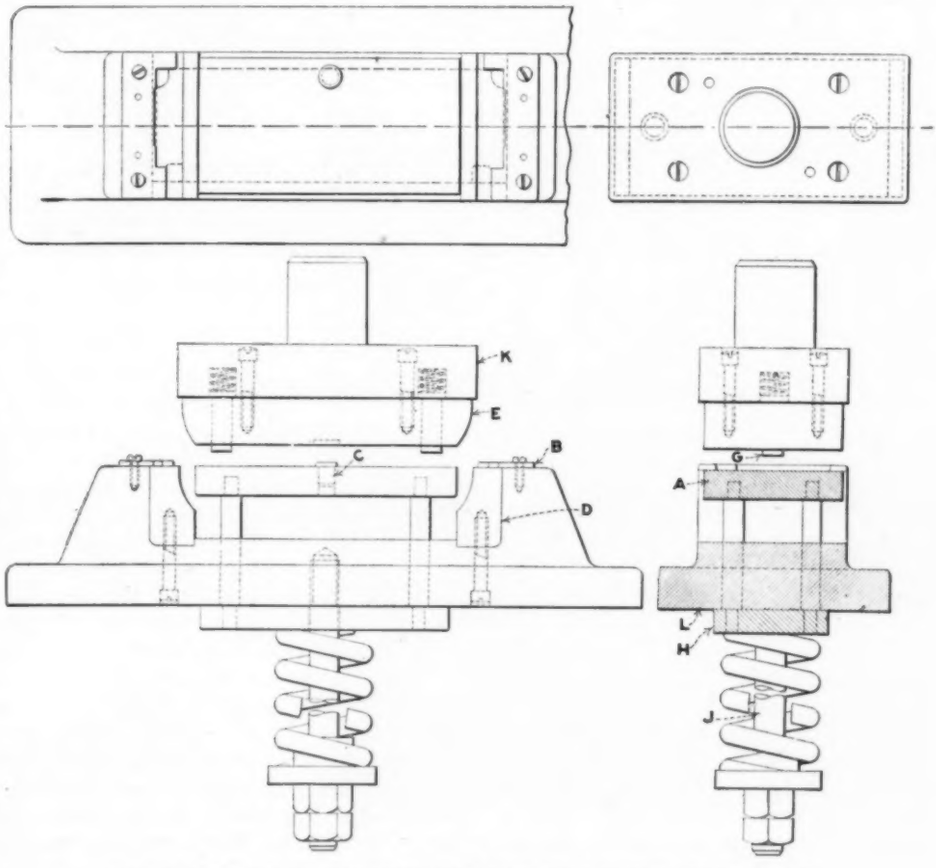


FIG. 5—THE FIRST FORMING DIE FOR THE THIRD OPERATION

gages *B* to square it. The pin also prevents the blank from slipping when the pressure pad *A* starts down under pressure from the punch. Blocks *D* serve as the forming blocks and whip the ends into the desired shape against the punch *E*. The pressure pad lifts the part from the die and the spring kickers *G* remove it from the punch in case there should be a tendency to stick. A large drawing spring under the die serves to apply pressure to the pressure pad *A* by means of plate *H* and rod *J*. This spring must be strong enough to keep the blank flat when the ends are being formed. The pad goes to bottom and the metal is set in this manner.

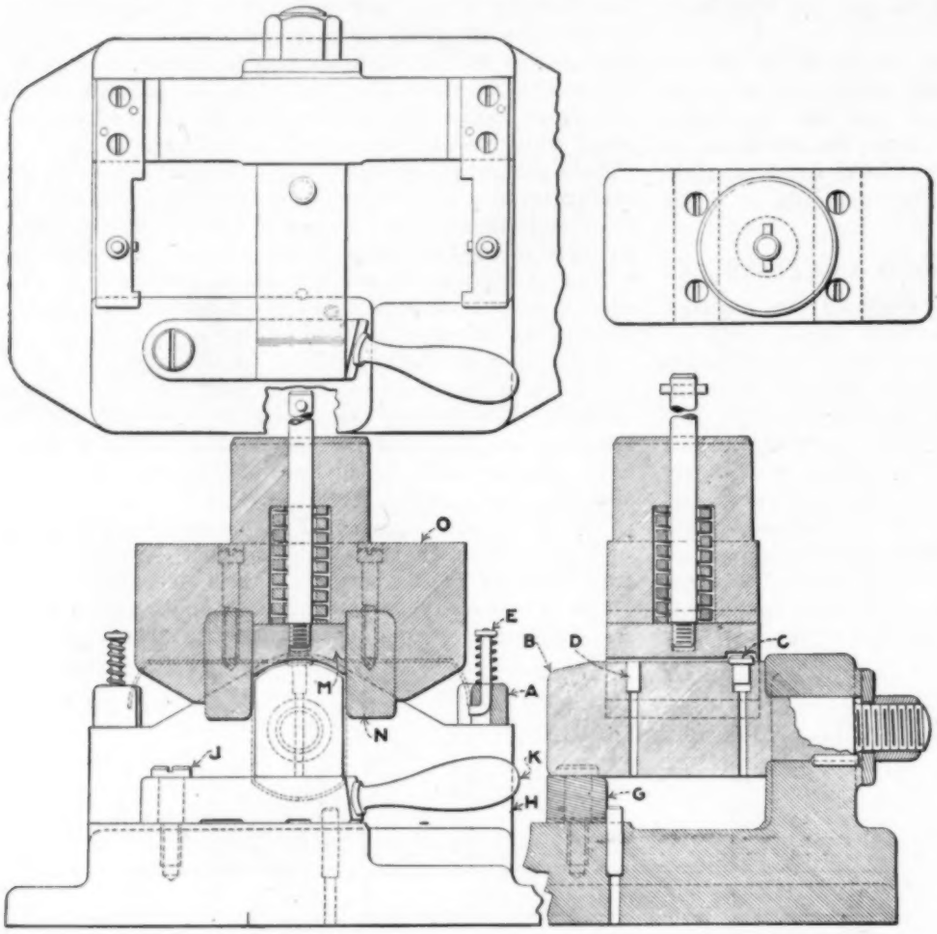


FIG. 6—THE SECOND FORMING DIE FOR COMPLETING THE PART

The punch *E* is built up of two pieces for the same reasons that the blanking die is built of two pieces. These two pieces are fastened to a semi-steel punch holder *K* by means of fillister-head screws and dowel pins. The die shoe *L* is also a semi-steel casting and is built up so as to back up the forming blocks *D* at each end of the dieblock.

The fourth, or final forming die is a horn die and is illustrated in Fig. 6. The blank is formed about the horn by forming blocks which bend the ends of the partially formed blank straight downward, and in this way close the shape. The blank is laid in the gages *A* tangent to the top of the horn *B*. The gages hold the part square and prevent it from sliding off one side or the other of the horn. The locating pin *C* in the top of the horn serves to hold the blank central. The small pointed stud *D* in the front end of the horn enters the stock about 0.010 or 0.015 in. when it is under pressure, and together with the locating pin prevents the blank from slipping. The L-shaped spring plungers *E* in the gages hold the blank in a horizontal position. These plungers go down with the ends of the blank a short distance, that is, until the blank has drawn far enough away from them to allow them to go back into place. They are returned to their operative position by springs. This movement is accomplished by the fact that the ends of the blank travel inward quite as rapidly as they go downward.

The front end of the horn is supported by the swinging arm *G*. The arm is a slip fit between the horn *B* and the die shoe *H* and is pivoted by a shoulder screw *J*. It is also provided with a handle *K*, placed at an angle convenient to the operator. After the blank has been formed into shape the arm can be swung aside and the finished part slipped off the horn. The other end of the horn has a large shank which is set into a vertical portion of the shoe casting and securely pinned and bolted in place.

The pressure pad *M* in the punch holder had to be made to extend below the bottom edge of the forming blocks *N*. It is essential that this pad be of the same radius as the top of the horn plus the thickness of the stock, and that the spring which backs it up be strong enough to bend the blank over the top radius of the horn before the side blocks *N* whip the two ends of the blank down. If this precaution were not taken the part would not form without wrinkling or kinking at the two corners on top. The spring also serves to hold the blank down against the horn when the punch is rising. If such were not the case, the part would rise up with the punch and be spread open at the bottom.

The side blocks *N* of the punch are straight and are set into a semi-steel punch holder *O*. The punch holder is so built that the blocks are backed up and cannot be forced outward and spread open when the part is being formed and they are under lateral pressure. It can readily be seen that if this could happen that an imperfectly formed blank would result. The sides of the horn are tapered slightly inward toward the bottom. This taper tends to help set the sides of the part vertical and insures the seam at the bottom being practically tight shut. Care should be exercised in setting the gages. They must be so set that the blank will lie at right angles to the horn. The center of the blank must also be tangent with the center of the top of the horn if the seam underneath is to be in the center. These conditions must be fulfilled if an accurately aligned part is to be obtained.

Automatic Grinding Machines

By ETHAN VIALL
Associate Editor, *American Machinist*

The second of two articles—Centerless grinding and some of its history—How the work is fed—Grinding tapered work on the centerless machine

CENTERLESS grinding consists in grinding the outside of cylindrical parts without holding the work on centers. The first machine for this work the writer ever saw employed only one wheel for both grinding and feeding. The wheel was about 4 in. wide and 14 in. in diameter. The face of the wheel was dressed off to a bevel and the short, straight pins to be ground, were fed across the face of the wheel by means of a trough-like guide set slightly "down hill" with relation to the grinding surface. The pins were fed into this guide at the higher end and as they came in contact with the grinding wheel, the angle of the wheel face and that of the guide caused the pins to be slowly rotated and drawn toward the lower end of the guide. At the same time the wheel ground the cylindrical surface. The device was described in a general article I wrote on page 1026, Vol. 39, of the *American Machinist*. This was in 1913 but some of the machines were in use two years earlier. The principle on which the present machines manufactured by the Detroit Machine Tool Co., Detroit, Mich., are made, is shown diagrammatically in Fig. 8, and also in Fig. 9, which was made from an actual photograph. In operation, the pieces to be ground are fed into a guide or chute which carries them onto the feed wheel. The feed wheel revolves and advances the work automatically across the face of the grinding wheel. In this machine pieces from $\frac{1}{8}$ to 3 in. in diameter may be ground. Pieces as short as $\frac{1}{4}$ in. may also be ground and from this up to over 16 ft. in length.

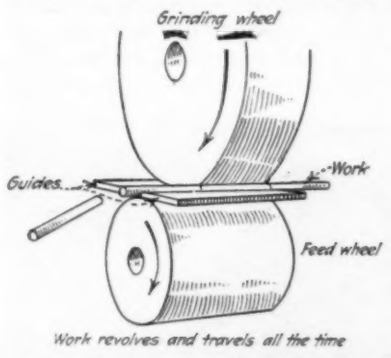


FIG. 8—THE PRINCIPLE OF THE DETROIT CENTERLESS GRINDING MACHINE

The grinding wheels used on this machine are 18 in. diameter and 4-in. face, with a 7½-in. hole. The feed wheel is of special composition and is 9 in. in diameter, with 8-in. face. With the feed wheel twice as wide as the grinding wheel the work starts to revolve before it comes in contact with the grinding wheel and continues to revolve until it is well clear of it.

The speed at which work travels through the machine is regulated by the angle at which the feed wheel is set. When taking roughing cuts the machine will remove from 30 to 60 cu.in. of metal per hour, depending on the class of work being handled. Roughing cuts from 0.003 to 0.010 in. deep may be easily taken. Accuracy within 0.0001 in. is claimed to be commercially possible and a very highly polished mirror finish can be secured when desired.

The general principle on which the Reeves centerless grinding machine works is shown in Fig. 10. This machine is made by the Reeves Pulley Co., Columbus, Ind. As shown, the machine is fitted for grinding shouldered spring bolts. The piece to be ground is held in the fixture *A*. The feed wheel *B* is a very hard grade of alundum (No. 120-W) and its office is to hold the piece in place and rotate it at the proper speed rather than to grind, the real grinding being done by wheel *C*. Wheel *B* is 18 in. in diameter and runs at a speed of 18 r.p.m., while wheel *C* runs at a surface speed of 6,000 ft. per minute.

Grinding Shouldered Work

On work of the kind indicated the shoulder prevents the piece from being fed through between the wheels, as is the case with straight cylindrical work. On this kind of a job the workman raises the holder *A* and pulls it out toward him, then he inserts the piece, slides the

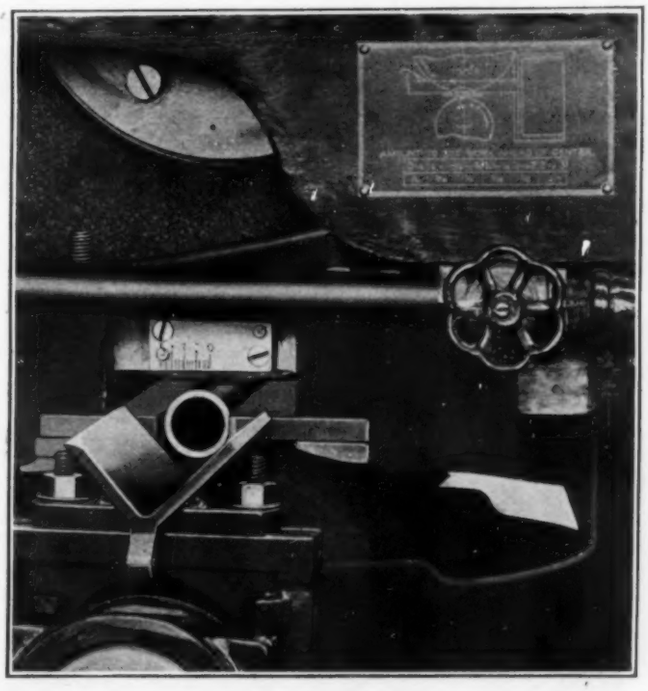


FIG. 9—VIEW SHOWING RELATIVE POSITIONS OF WHEELS AND WORK

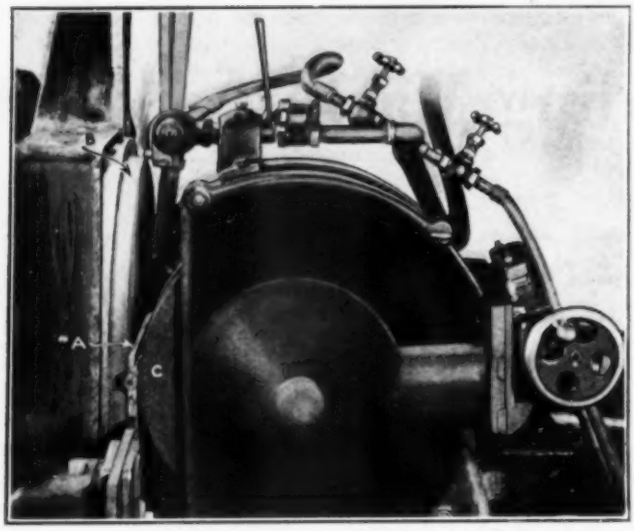


FIG. 10—REEVES MACHINE FITTED FOR SHOULDER WORK

holder back and lowers it into place between the wheels as shown in the illustration.

Some spring bolts that have been ground are shown at the left in Fig. 11, while at the right are some piston pins. These piston pins lend themselves nicely to continuous grinding and a machine set-up is shown in Fig. 12. Here the operator places the pins to be

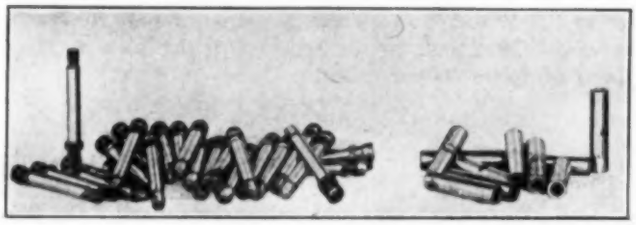


FIG. 11—EXAMPLES OF CENTERLESS GROUND WORK

ground in a chute and they feed through between the wheels and drop into a container at the back of the machine. On work of this kind, where there is considerable stock to be removed from hardened pieces, several passes are needed to reduce the work to the required size. In this particular instance 0.020 in. of stock was removed from the pins and six passes were required. They were run through at the rate of 20 per min. for the first five times, then at the rate of

FIG. 12—METHOD OF FEEDING STRAIGHT CYLINDRICAL WORK

10 per min, for the last pass. If 0.002 in. only had been left to be removed, it could have been done in two passes, according to the operator.

The grinding of tapered pieces on a centerless machine is shown diagramatically in Fig. 13. This was done on a centerless grinding machine made by the F. C. Sanford Mfg. Co., Bridgeport, Conn. The pieces are soft steel knife sharpener blanks, 8 in. long and $\frac{5}{16}$ in. in diameter on the straight portion. About 0.023 in. is removed on an average at the rate of one inch per second. The work is fed through between the

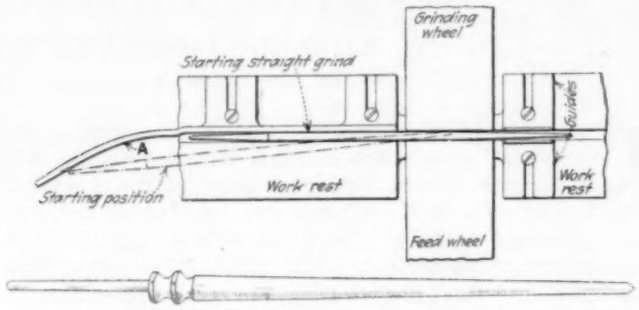


FIG. 13—METHOD OF GRINDING TAPER WORK IN A CENTERLESS MACHINE

wheels continuously, the cam *A* guiding the rear end so as to produce the proper shape.

The machine shown in Fig. 14 is made by the Production Machine Co., Greenfield, Mass. While the work feeding arrangement is very similar to that used on some of the centerless grinding machines, the grinding element is an abrasive belt. The job being done is the

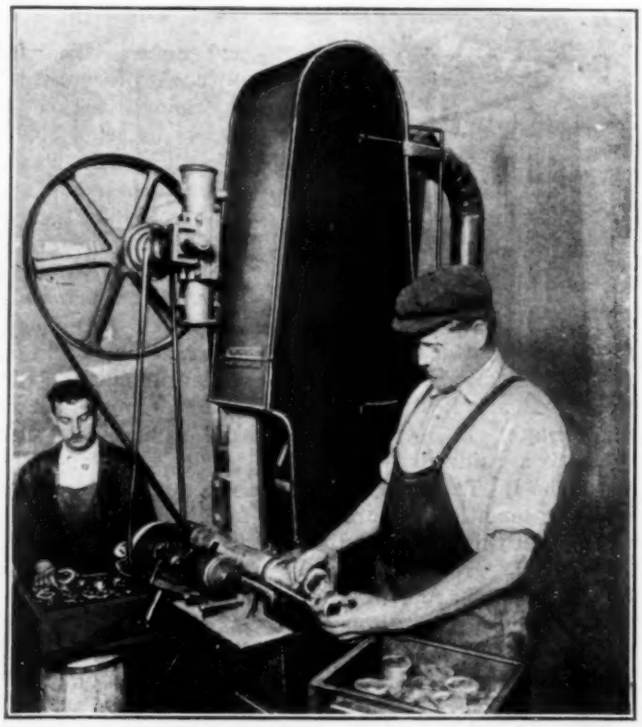


FIG. 14—A CENTERLESS POLISHING MACHINE USING AN ABRASIVE BELT

polishing of the peripheries of die collets. Though the amount of metal removed is very small, the action is real grinding as well as polishing. The feeding wheel is plainly shown at the left, just in front of the abrasive belt. The speed of the feeding movement is controlled

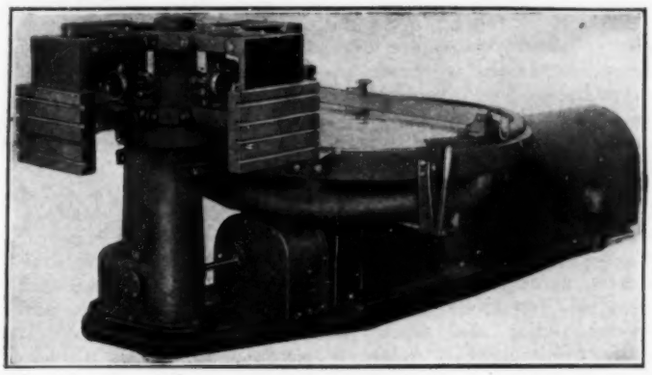


FIG. 15—GARDNER CONTINUOUS FEED DISK GRINDING MACHINE

by the angle at which the feeding wheel is set in relation to the work and belt. Any cylindrical work within the capacity of the machine may be rapidly polished automatically. Steel molds used for formers on inner tire tubes, 3¼ in. in diameter and 10 ft. long are polished, ready for a special coating, at the rate of 40 sec. per piece.

The abrasive belt used on this type of machine is 6 in. wide and 14 ft. long. It is practically an endless belt, as the special interlocking belt-joint makes a smooth joint that does not rap or knock as it goes over the pulleys or work. The abrasive belt runs over a cushion leather-belt, corrugated on its face in herring-bone fashion. This gives to the abrasive belt high points for cutting and low points for chip clearance. Tension devices keep both the leather and abrasive belts in proper tension at all times. The leather belt is the shorter of the two and runs over an idler placed below the one over which the abrasive belt runs. The leather belt runs at a speed of 7,000 ft. per minute.

In the machine shown in Fig. 15, the work is held in special fixtures bolted to the faces of the turret and is carried to the grinding element as the turret revolves. This machine is made by the Gardner Machine Co., Beloit, Mich. The grinding element is a horizontal grinding disk 53 in. in diameter. The turret has four faces, or work-tables, to which the work is clamped and while working the turret revolves constantly. As each turret face with its fixture and piece of work approaches the grinding surface of the disk, it is automatically lowered by means of a cam until the surface to be ground rests on the abrasive disk. The pressure of the work on the grinding disk may be regulated by means of a compression spring or by regulating the amount of weight in the holding fixture. A micrometer screw-stop permits grinding to fixed limits. Upon completion of the grinding of a piece, the work-table and fixture with its load, are automatically raised before the work travels over the edge of the grinding disk.

Flexible Feeding Mechanism

The feeding mechanism can be arranged so that a work-table and fixture will make a complete circuit in 1, 2 or 4 minutes. It is controlled by a friction clutch which enables the operator to stop the feed without stopping the grinding disk.

The machine shown in Fig. 16 was made by the Robinson Automatic Machine Co., Detroit, Mich., for

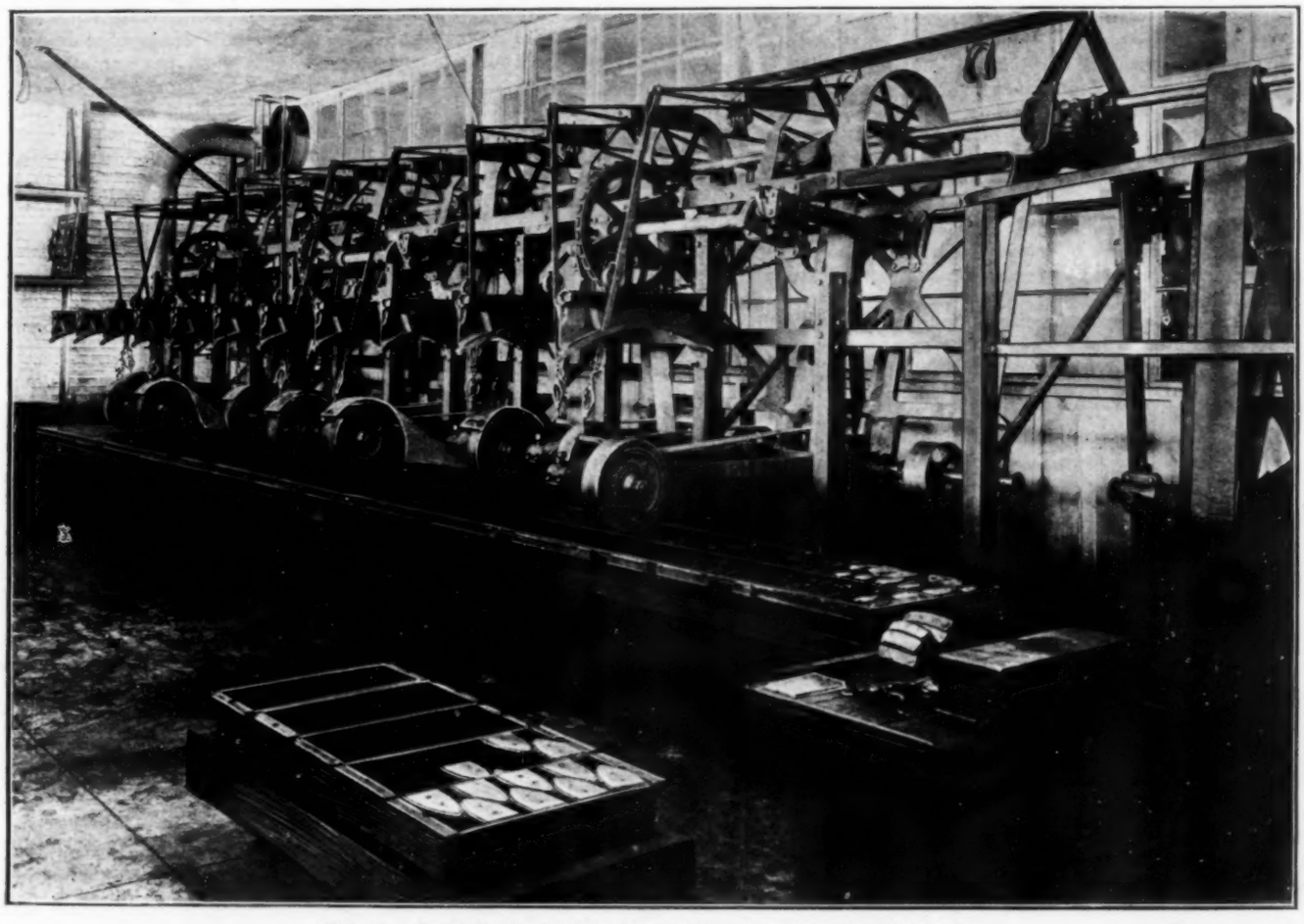


FIG. 16—AN EIGHT-WHEEL AUTOMATIC POLISHING MACHINE

polishing large numbers of sad irons, stove tops, or other flat surfaces.

The machine as shown has eight polishing wheels carried on swinging supports actuated in such a way as to move the polishing wheels back and forth over the work at right angles to the feeding movement. The work to be polished is placed in special holders or follow boards, and carried along under the wheels by means of an endless chain which engages the underside of the holders and slides them along the ways of a supporting table.

Growing Need for Machinery in British India

IN Trade Information Bulletin No. 85, Far Eastern Division, published by the Department of Foreign and Domestic Commerce, of the United States Department of Commerce, as a supplement to Commerce Reports, the following analytical statement is given:

American machinery (particularly machine tools) is found in many places, and carpenters' tools, especially files and hammers, are growing in popularity. American hardware, principally locks, padlocks, hinges, nails, tacks, screws, bolts, nuts, and washers, has long been well established, but is now having to meet sharp competition, not only from the established British manufacturers, but from Germans, Belgians, and French, whose cost of production is alleged to be the lowest in the world in certain items.

Certain kinds of American machines are to be found in some cotton mills and the types in use do not differ very greatly from those which we have sold to China. If the United States can meet competitive prices and will produce designs suited to the country, a market can be built up here for sawmills, rice, flour, and oil mills; cotton gins and cotton presses; machinery for cotton, silk, and woolen spinning and weaving; pumps, threshers, reapers, mowing machines, harvesters, sprayers, tractors, plows, harrows, disk harrows, cultivators, seeders, drills, hoes, and shovels; electric motors; and a large number of similar articles. Even the government of India found it desirable to buy American sawmills. American logging outfits are in use. American hydroelectrical machinery is found in the principal plants, and American electrical apparatus of various types is gaining in popularity.

There is a growing demand for many kinds of patented machines and appliances, such as typewriters, sewing machines, cash registers, multigraph machines, adding machines, and a host of contrivances for domestic and business use.

It must not be supposed that the Indians are clamoring to buy these articles. There are only a few machines of certain kinds in use in India, and these are often only for purposes of trial at government experiment stations or on the estates of Indian princes or large landowners. Some give satisfaction and others do not, but on the whole they are growing in popularity, the difficulties are being overcome, and their use will increase little by little, for hydroelectric transportation, forestry, and certain agricultural conditions resemble more closely those of the United States than of Europe. The growing demand, however, is largely being supplied by other countries, which take more pains to cater to Indian requirements.

Apart from the lack of capital, one of the principal reasons why machinery is not used more in India is the relative abundance and cheapness of labor. Children sometimes receive 6 cents a day, women 10 to 16 cents, and men 10 to 32 cents. They lodge and feed themselves and, although not efficient, are often cheaper than machines, taking into consideration the purchase price, fuel, wages, other operating costs, repairs (a large item), and obsolescence of the machinery.

In spite of the huge population there is no general surplus of labor. Wages are increasing rapidly, while efficiency decreases, as the workmen know that they do not have to exert themselves to hold their jobs, since there are usually vacancies in the mills, in addition to the fact that vast areas of land are uncultivated and many landowners would be glad to secure numbers of laborers or tenants.

The cotton mills and other industries of Calcutta, Bombay, Ahmedabad, Ujjain, Indore, Delhi, Agra, Madras, Cawnpore, Lahore, Lucknow, Sholapur, Baroda, Nagpur, Bangalore, Mysore, and many other places have made large drafts upon the industrial population, and the constant demands for laborers in the tea gardens of Assam and in the indigo and sugar plantations of Behar make it increasingly difficult to secure common labor, not to mention skilled or partly skilled mill operatives. Workmen are constantly very independent, strikes are called on the slightest pretext, and the net result is a rapid increase in wages, not accompanied with added efficiency, so that the cost of production tends to rise, while the buying power of the whole population, and consequently its effective demand for manufactured commodities, is largely increased.

Under these circumstances employers are turning more and more to machines. Coal-cutting machinery is urgently needed in the Bengal coal fields, as the supply of labor is inadequate and the output per man is very low. The high price of fodder and the shortness of the planting season make tractors very desirable for plowing heavy soils in many parts of India, and it will soon be difficult to produce certain staple crops by the use of bullocks and primitive plows. Rice mills are coming more and more into use and are rapidly superseding the primitive methods of husking rice by grinding in hand mills or by pounding in mortars. Improved steel and iron cane crushers are taking the place of the old sugar mills with wooden rollers turned by bullocks, and flour mills are on the increase.

It will not be long before the labor situation will force the adoption of machines wherever circumstances permit. Fortunately for this movement toward industrialization in India, it has been found that many individuals of a number of the Indian races can be trained to perform fairly well relatively simple operations on machines which are not too complicated. The enormous profits of the cotton and jute mills (often from 30 to 100 per cent a year) show how profitable the use of machinery really is, and it is only a matter of time until there will be a large and constant demand for the machines and appliances mentioned, many of which are regularly made in America.

The increasing numbers of operatives in the mills, who are receiving substantial cash wages (some families earn 80 to 100 rupees a month when all members are working), are constantly calling for larger quantities of imported goods.

The preceding paragraphs constitute only a small part of the bulletin. In addition to statements of specific needs, there are taken up such general subjects as the complexity of Indian markets, commercial districts and ports of India, and business methods and terms. The author is C. C. Batchelder, American Trade Commissioner.

Tests of Welded Rail Joints

Two welded 7-in. rail joints were recently tested for the Welded Rail Joint Committee of the American Electric Railway Association and the American Bureau of Welding. One of the joints, a thermit weld, failed at an ultimate load of 600,000 lb. The other joint, of the welded fish plate type, failed at about 200,000 lb. Transverse tests were also made on similar welds. These tests illustrate the methods which will be used in testing several hundred joints representing the types at present in use in this country. The tests were performed by the Bureau of Standards.

Engineering Features of Fleet Operation

By EDWARD E. LaSCHUM
General Superintendent, Motor Vehicle Equipment,
American Railway Express Co., New York

The effect of standardization on motor transportation vehicles—The maintenance problems—Distribution of maintenance costs—Analysis of emergency calls on gasoline and electric trucks

THE BUSINESS of the American Railway Express Co. is transportation. In fact, transportation is its sole function. Sight is sometimes lost of the fact that high efficiency in the business of transportation can only be attained through a most careful analysis and careful consideration of those fundamental problems which must necessarily be solved in order to insure perfect and most economical operation for the longest period of time.

During the year 1922 more than 184,000,000 shipments were handled and these shipments had to be handled at least once at point of origin and at least once at point of destination in addition to handlings on route. The average weight per shipment was approximately 82 lb., producing a gross revenue of approximately $294,000,000. From the magnitude of the business it can readily be seen that it is necessary for us to make a most careful selection of vehicle equipment if economical operation is to be obtained.

In New York City we require 655 motor and approximately 900 horse-drawn vehicles. In Chicago we use in daily service about 648 horse-drawn and 306 power vehicles, including 25 tractors with about 60 trailers. Our total vehicle equipment throughout the United States and Canada consists of 2,636 gasoline vehicles; 1,195 electric street trucks; 324 electric industrial platform trucks; 100 semi-trailers; and about 8,500 horse-drawn vehicles, which means a total of 12,755 units. Approximately 33⅓ per cent in numbers are motor vehicles but the 33⅓ per cent has a carrying capacity of over 50 per cent.

Statistics show that in our service the horse-drawn vehicle averages approximately 12 miles per day; the electric vehicle 20 miles per day; and the gasoline vehicle 30 miles per day, which surely is sufficient to prove that if we could get a record of ton-miles, motor vehicles are doing by far the greatest amount of actual work.

In the beginning, or from 1912 to about 1917, the experiment was in the making and believe me, there was need of engineering brains in the maintenance end because the changes were so rapid that only alert, quick-thinking maintenance men could keep up with the pace set by the engineers.

It is a lamentable fact that on July 1, 1918, when all the express companies were merged into one company, the new company found itself in control of 59 different makes of motor vehicles and in these 59 different makes there were 131 different models. There were a considerable number of old-line, or so-called manufactured trucks, and you would think that if we had purchased one make we would have had a standardized maintenance proposition, but when I tell you that out of 377 trucks manufactured by an old-line company we had 21 different models in which the parts were only in a small degree interchangeable, you can see how far from standardization we were kept by the engineers. We have recently bought trucks from an old-line company and after receiving the first lot changes were made without notice to us before we received the second lot, even though the second lot was purchased within a few months after the first, making it necessary for us to carry two radiators in our stock room where one should have been enough. In one particular case we have received trucks from an old-line company and in a fleet of eight trucks, all delivered at the same time, there were three makes of magnetos.

This great difference in models and in constructional units complicated and made difficult our maintenance problem, and added much to its cost. We realized, though, in the beginning that we were starting with an industry in which there would be rapid development, and while we were saddened by the cost of maintenance we are now gladdened by the fact that the development

THE SELECTION of motor vehicle equipment in the beginning has much to do with the maintenance problem and here engineering knowledge is necessary in order to keep away from the complicated apparatus that is offered by old-line companies.

It is not necessary to have an engineering staff to supervise the actual maintenance and repairs but it is necessary to have engineering knowledge to keep mechanical forces or inexperienced executives from substituting or changing parts with devices that prove no better.

The business spotlight should be focused first, on the organization of maintenance; second, on the organization of operation; and each organization should be required to analyze costs and to study legislation referring to truck operation.

From a paper read before the Metropolitan Section of the S. A. E. on April 19, 1923.

of motor trucks and the standardization of parts has reached a stage, we believe, of common practice.

The selection of motor-vehicle equipment in the beginning certainly has much to do with the maintenance problem and here again engineering knowledge is necessary in order to keep away from the complicated apparatus that has been offered by old-line companies in particular, and by some concerns who offer complicated apparatus which is vastly different from standard or common practice.

I don't know how many spark-plugs there are to be had, but I do know that there is only a slight difference, if any, in the intrinsic value of the various makes, and that the owner or operator who is continuously trying different spark plugs is creating an unwarranted expense.

I do not believe it is necessary to have an engineering staff to supervise the actual maintenance and repairs but I do believe it is necessary to have engineering knowledge to keep mechanical forces or inexperienced executives from substituting or changing from that to that, which will prove no better. Take for instance, the question of wheels. The old wood artillery type of wheel has given comparatively little trouble; the solid steel wheel may be just as good, in fact, I think it is and I believe there is a real benefit to be derived from the use of the so-called resilient wheels under certain conditions but the truck owners should not be influenced to the extent of incurring an expense for any accessory unless he has sufficient indisputable knowledge that the expense will be returned by economical performance or extended life. Therefore, before changing from the conventional type of wheel or the conventional type of tires and adopting some of the so-called resilient or semi-pneumatics, a careful analysis should be made by a competent engineer whose unbiased mind should enable him to advise that which is best.

Overcoming Natural Wear

In the old days the frames were a continuous source of trouble but under the practice of today it takes something out of the ordinary to break them. We don't have broken frames to contend with in regular service, but we would have them broken like the other fellow has if we did not exercise the proper supervision over the operation and by inspection and stitch-in-time methods keep the rivets tight, the wearing parts properly lubricated, and the natural wear corrected.

This same thing generally applies to most of the other principal units of the trucks, that is, steering transmission and axle units should be lubricated and adjusted to compensate for the natural wear. There is hardly any reason for neglect, other than gross carelessness, when matters need attention on these units, affording as they do easy accessibility for inspection and repair.

Occasionally, faults develop in the hidden mechanism of the motor, and due to poor judgment, they are not given attention in time to prevent expensive repairs. This particular unit is deserving of and should have more careful inspection by competent repairmen so that it may have a fair opportunity to perform satisfactorily with the other units of a well-designed and well-built motor truck until after a reasonable period, when general repair or rebuilding becomes necessary.

We know that much has been accomplished by engineers in the way of simplification and standardization and we would like to see them continue towards standardization, were it not for the fact that carrying standardization too far in motor vehicles would deprive them of individuality. While to my mind building motor vehicles has reached the stage of common practice, still the engineers must contrive some individuality into the jobs.

Distribution of Maintenance Costs

I know that figures are dry and don't lie, still I believe that the following figures on maintenance costs will be highly interesting to those who have not gone into them in detail. Not considering drivers' wages, depreciation, interest and insurance, our operating costs are distributed as follows:

Gasoline	30.00	per	cent
Cylinder oil	2.25	"	"
Tire costs	2.50	"	"
Painting	1.30	"	"
Body repairs	4.75	"	"
Chassis repairs	35.20	"	"
Garage expenses	24.00	"	"
Total	100.00	"	"

From the above you will see that gasoline, of course, is one of the important items of expense, and the live garage superintendent will always watch the item. For some reason gasoline seems to be the common prey of everybody. It is more likely to be used indiscriminately than any other item. Employees want to use it for washing parts, and employees and officials connected with the firm using their own car for company's business feel that they should have their gasoline tank filled, but all these things can be and no doubt are controlled.

Gasoline should be saved first, by knowing that the carbureter is right for the particular truck and that if any adjustments are to be made that they be made by a capable carbureter man. Better still, if possible use a non-adjustable carbureter. Then teach the driver that a rich mixture which may get him over the grade without shifting gears is bound to waste 35 per cent; this waste will accumulate carbon which will cause a bad working engine in a short time; and as a matter of fact if he would shift the gears he could go over the grade with the whole machine in better condition than the fellow who is kidding himself about the wonderful flexibility or pulling power of his particular truck or touring car.

There are numerous gasoline savers or adulterants offered for sale. The vendors claim to eliminate carbon and to crack or break up the gasoline in such a manner than much greater mileage will result. I have tried a number of these gasoline adulterants without any benefit and I believe that the Society of Automotive Engineers would bear out the statement that from the standpoint of saving gasoline the so-called gasoline savers, of the liquid, powder, crystal or tablet type, are not valuable.

I believe that auxiliary air devices, which are operated from the dash as the driver may see fit, will accomplish nothing, but there is a possibility of an auxiliary air device being so constructed that it will function only at pre-arranged engine speeds, by hooking it up with an accelerator pedal or with a fly-ball governor.

There is the question of cylinder oil. To my mind there is nothing connected with the maintenance of

motor vehicles which can possibly be more confusing to the lay mind than the selection of cylinder oil suitable for lubricating engines. I believe that oil refiners are serving the country with the best that can possibly be gotten out of crude petroleum, but the owner or buyer generally knows little and he must make a selection from hundreds offering him oil and telling him about as many different stories.

The next item of expense is tire costs, which we must agree are very low. As a matter of fact, the tire cost today is approximately 25 per cent of what it was in 1913 and 1914. Solid and pneumatic tires are showing at least four times the mileage they did in the period mentioned and they are giving from two and one-half to three times as much service as the old mileage guarantee, which was from 3,500 to 5,000 miles on pneumatics and from 7,000 to 8,000 miles on solids. The percentage of replacements for defective workmanship or material is so low that it is of practically no importance.

The price of painting, of course, would differ, but generally to keep the trucks well painted the cost should not exceed that which I have mentioned. Bodies with durability built into them in the beginning should not cost more than I have mentioned for repairs, and I believe they should last fully as long as any chassis upon which they have been installed.

The greatest item of expense is mechanical repairs to chassis. That surely should not exceed the amount that I have mentioned, and here again I fully believe the cost of mechanical repairs to chassis can only be kept down by employing proper garage employees, and issuing instructions worked out to give the driver a more extended conception of his duties and responsibilities for the valuable equipment placed in his hands.

Garage expenses, of course, can be controlled because generally they are fixed, with the exception of light and heat. As a matter of fact, to a great extent light and heat are controlled by seasons.

Analysis of Emergency Calls

For the year 1922 I have taken the following cities —Atlanta, Buffalo, Chicago, Cleveland, Detroit, New York, San Francisco and Washington, D. C., and in these cities you have the snow belt, you have cities which have little snow, and you have cities which have no snow and no cold weather. In these cities there are 802 gasoline trucks, very few of them less than 2 tons capacity, the greatest number being of 2 and 3½ tons capacity, and a considerable number being of 5 tons capacity. Generally, there are 300 working days per year but from these 802 trucks we have accomplished 306,348 working days of eight hours. The total mileage, as near as we know, was 9,190,440 miles.

During that year we received 6,254 calls for help from these trucks. I mean by that that there was something the matter with the truck, and the driver called the garage for assistance. This was a little less than seven times per truck per year.

Following is an analysis of the causes of these calls, given in percentages of the total number:

Motor bearings	0.8
Spark-plugs	5.9
Ignition system	9.1
Carbureter	8.6
Gasoline lines clogged or leaked	7.6
Broken fans or fan belts	9.3
Radiators	1.1
Water pump or line	1.6
Radiators or pumps, frozen	0.2
Governors	0.5
Steering gears	3.3
Clutch	3.0
Propeller shaft	1.5
Universal joints	1.1
Transmissions	3.0
Differentials	0.5
Rear axles	0.9
Radius rods	0.9
Drive chains	3.8
Wheels	1.5
Springs	1.8
Brakes	2.2
Tires	3.3
Lights	1.0
Accidents, only	1.6
Out of gasoline or oil	3.1
Miscellaneous	23.8
Total	100.0

In other words there were only 50 cases of bearing trouble, and rarely a case of a full set of connecting-rod bearings burning out.

Spark-plugs caused 5.9 per cent of the calls. The trouble was due, almost without exception, to the fact that the driver had been using a choker and had fouled the plugs by a mixture too rich; this gave us an opportunity to teach him that the trouble could have been avoided had he used the gearset. Here let me say that during the same period and for the same number of trucks our spark-plug replacements have been a little less than six spark-plugs per truck (four cylinders) per year, or a little less than one-half of one spark-plug per truck per month.

The ignition system caused 9.1 per cent of the trouble. By this I mean other than the spark-plugs, such as magneto, distributor, wiring, switches. As a rule the trouble was of minor importance, which required only slight adjustment or repair. This was done at once and the truck was able immediately to resume its work.

The balance, 23.8 per cent, was for minor troubles, such as inability of the driver to start the motor, the truck in the ditch, or in the mud or snow.

During the same year in the same cities we had 722 electric trucks, from which we obtained 226,716 working days. On these trucks we were called out less than two times per truck per year, or for a total of 4,987,752 miles. During the year we had approximately 91 electric motors burned out, that is, either the field or armature burned out, which was 4.8 per cent of the trouble, but that is small compared to the 4,987,752 miles. In many cases it was due directly to the fact that the trucks had to encounter deep snow, mud, ice, cold, rain, heat and, in all probability, considerable overloading. We had 366 cases of batteries exhausted, which caused 19.1 per cent of the trouble, but it also means that a battery was exhausted once per truck per two years. The other items of importance were controllers which caused 12.1 per cent; steering gear 6.2 per cent; axles 1.5 per cent; brakes 5 per cent; springs 1.3 per cent; drive chains 11.6 per cent; and here let me say that on the modern electric truck, drive chain troubles were eliminated. The balance is made up of miscellaneous items too numerous to mention, but you who are doubtful of the electric trucks' ability to perform should take note of the fact that 722 electric trucks performed better than 314 truck days per year.

with less than two trouble calls per truck per year.

The following figures, representing the average of three well-known makes of trucks, on the distribution of time and material costs for chassis overhauling repairs on different parts and operations may also be of interest.

	Man-Hrs.	Mat. Costs
Disassembling	67.42	.84
Motor	153.42	397.85
Frame	62.58	1.11
Steering	41.50	1.78
Brakes	34.83	28.83
Radius and tie rods	7.83	5.95
Transmission	36.08	51.68
Radiator hood and muffler	15.25	.56
Front and rear construction	24.83	44.27
Clutch	7.17	14.44
Differential	19.75	46.22
Water pump	.08	.03
Springs	18.95	15.17
Carburetor	8.17	.60
Jackshaft	3.50	.....
Magneto	4.00	2.43
Wheel	.....	5.63
General accessories	216.50	.95
Miscellaneous	5.50	90.50
Total	727.36	708.84

Surely all of the above is an indication of the reliability of the motor vehicle and its component parts and surely it is an indication of a service which can be accomplished under management.

The business spotlight is being turned on the motor truck and such organization as there is back of it. The light should be focused, first, on the organization of maintenance; second, on the organization of operation. Each organization should be required to analyze costs, and to study legislation referring to truck operations. Each organization should be required to analyze costs in order that nothing may be left undone which will bring about greater efficiency and satisfaction to the owner.

Steel Works and Rolling Mills, 1921

The Department of Commerce announces that, according to reports made to the Bureau of the Census, the value of products of establishments engaged primarily in steel production and the rolling of iron and steel products amounted to $1,481,659,000 in 1921, as compared with $2,828,902,376 in 1919 and $918,664,565 in 1914, a decrease of 48 per cent from 1919 to 1921, but an increase of 61 per cent for the seven-year period from 1914 to 1921.

In 1921 reports were received from 494 establishments, a decrease of 6 from the number reporting in 1919, but an increase of 67 over those reporting in 1914. Of those reported for 1921, 190 were located in Pennsylvania; 85 in Ohio; 32 in New York; 28 in Illinois; 24 in Indiana; 17 each in New Jersey and West Virginia; 15 in Wisconsin; 13 in Massachusetts; 9 each in Alabama and California; 8 in Michigan; 6 in Missouri; 5 each in Connecticut, Kentucky and Maryland; 4 each in Delaware, Rhode Island and Washington; 3 in Minnesota; 2 each in Iowa and Virginia; 1 each in Colorado, Georgia, Maine, Oregon, Tennessee, Texas and Utah.

The decrease in the value of products has been accompanied by decreases in the number of persons employed, in the total amount paid for salaries and wages, and in the cost of materials used.

In January, the month of maximum employment, 293,284 wage earners were reported; and in July, the month of minimum employment, 183,024, the minimum representing 62 per cent of the maximum. The average number of wage earners employed during the year was 235,515, as compared with 375,088 in 1919 and 248,716 in 1914.

Doing Good Work Under Difficulties

By Frank C. Hudson

If anyone has doubts as to the lack of equipment in railroad shops or feels that the plight of the railroads is due to the inefficiency or pure cussedness of the personnel, a visit to the Denver & Rio Grande shops at Salt Lake City, Utah, ought to open his eyes. Just how old the shop really is, it is not easy to say. Although having brick walls, it is of the old timber truss construction without any apology for a crane or adequate facilities for lifting or carrying the heavy parts of locomotives. In order to get an old firebox out of a boiler it was necessary to both jack it up and then dig a hole in the shop floor.

Removing the Wheels

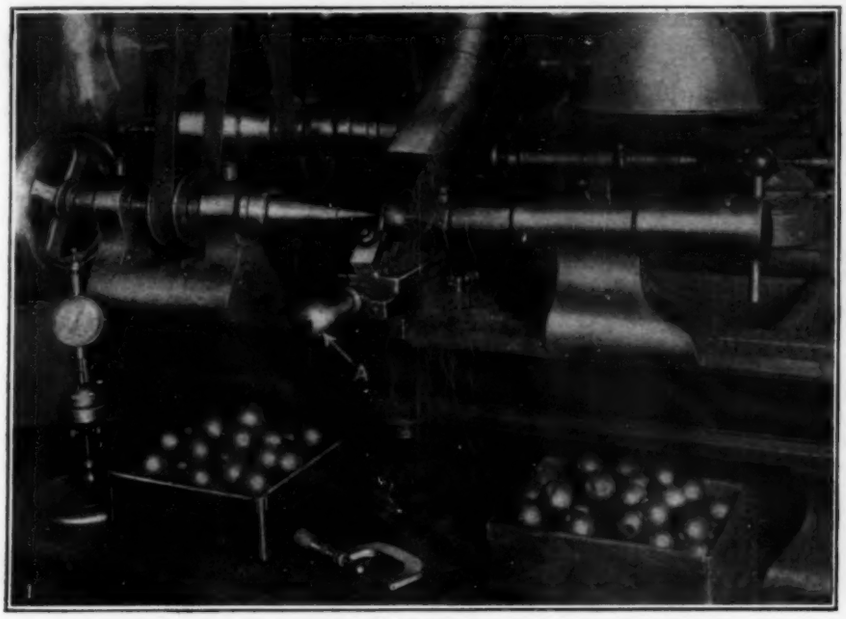
The only way of lifting a locomotive off its wheels is by the old system of six permanent screw jacks with cross beams between. The machine tool equipment is similarly out of date for the most part, and in consequence very inefficient. Yet, in spite of these handicaps they turn out from 12 to 15 locomotives a month, some of them large Mallets, for the grades are extremely heavy between Salt Lake and Denver.

The assistant superintendent of motive power is an old time railroad man who has the faculty of getting on with men. He has gathered around him a corps of very capable assistants, and there is more of the happy family spirit than we usually find. The machine shop foreman learned his trade in a railroad shop and then went out into other lines of machine work, including a shop employing production methods. This makes a good combination and he is taking advantage of his experience in reducing time and costs. If the equipment of this shop could be brought up to date, we should see a very material reduction in the cost of repairs. In addition, locomotives would not be kept out of service as long as at present and so have more days in service, earning dividends for the railways.

Poor Equipment Proved To Be An Expensive Luxury

All this gets back to the man with the check book and cannot be attributed in any way to the mechanical department. No manufacturing or jobbing shop could live under such conditions and it is ridiculous to lay the high cost of railway repairs to the inefficiency of the mechanical department in such a case as this.

There were and are, shop rules which interfere with maximum production and which should be modified in union shops. But there is a great need of friendliness and co-operation instead of the antagonism and distrust which exists in too many cases. Here is where the shop referred to can be studied to advantage and probably copied in many ways. But no increase in either harmony or efficiency can take the place of good machine equipment and adequate handling facilities for material.



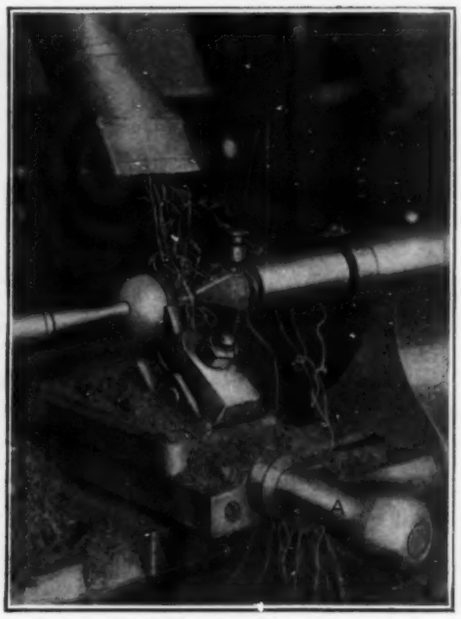


FIG. 1—TURNING THE HARD RUBBER BALLS. FIG. 2—DETAILS OF THE TURNING TOOL

Machining Hard Rubber Parts For Water Meters

By FRED H. COLVIN
Editor, *American Machinist*

Turning and slotting hard-rubber balls—Automatically facing hard-rubber disks—Diamond tools at high speed —Some assembly operations

THE BALL SEAT, which was so much in evidence in the first article on water meters, was for the seating of a hard rubber ball that forms the axis for the measuring ball and disk in the measuring chamber. Some of the balls are shown in Fig. 1 which also shows the way in which they are turned between centers in a bench lathe. The rough balls are shown in the box at the right, just as they come from the molds, while the finished balls are in the box at the left. There are, however, two turning operations, the finishing cut merely trimming up any imperfections which may have been left by the roughing tool. Diamond cutting tools are used in both cases.

The ball is formed by swinging the tool around a center by means of the handle *A*, in both Figs. 1 and 2. The diameter of the ball is held within very close limits, as both it and the disk must work freely and without leakage. The balls are measured with the micrometer shown in Fig. 1 and also tested for both diameter and roundness by the dial gage to be seen at the left. The ring of this gage supports the ball while being turned under the pointer and the dial gage shows any variations. Details of the tool and the lathe centers are shown in Fig. 2. It will be noted that there is an exhaust pipe directly over the turning tool and that the rubber chips are drawn up into this pipe as they come off. A few drop on the machine but the majority of them escape up the suction pipe together with most of the odor from the rubber.

The balls have to be slotted on three sides to receive the disk plates and this is done in the Garvin milling machine shown in Fig. 3. The fixture shown on the table holds the ball while it is being slotted and indexes it so that the three slots can be cut in proper relation to each other. The ball is held between two cupped plungers, one of which is seen at *A*. The indexing is done by the handle *B*, while handle *C* clamps and releases the ball. Before the last slot is cut, the slide *D* is pushed in under the ball for support. When the ball is released it is brought out on the slide as shown.

The gages used are shown at the left. Gage *E* inspects the width of the slot while the one at *F* gages the thickness of the material left by the milling cutters. The relation of the slot to the outside of the ball is tested by the dial gage at *G*, the slot in the ball sliding over the wings *H* and under the cup above. The ball is then tested for strength in the machine shown in Fig. 4. The slotted ball is slipped over the plates *A*

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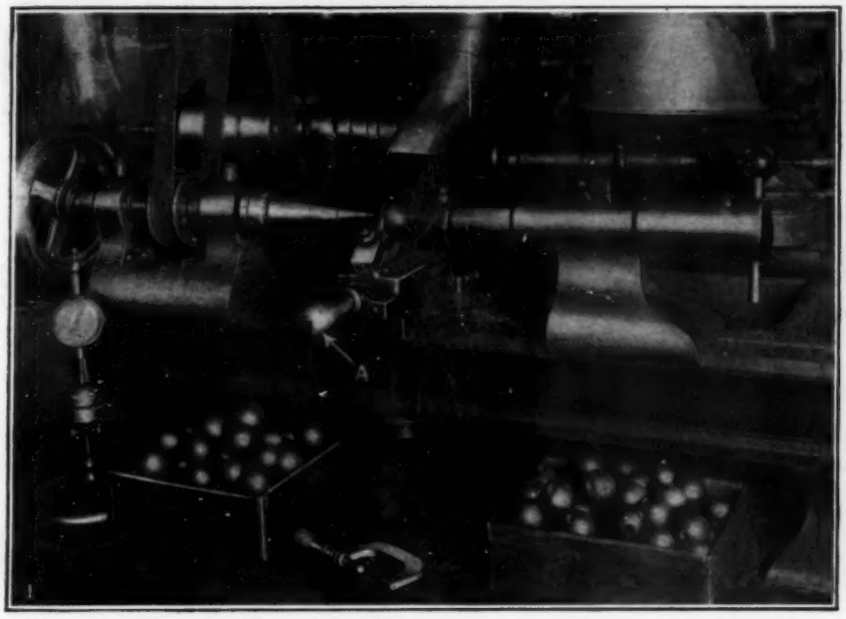
Poor Equipment Proved To Be An Expensive Luxury

All this gets back to the man with the check book and cannot be attributed in any way to the mechanical department. No manufacturing or jobbing shop could live under such conditions and it is ridiculous to lay the high cost of railway repairs to the inefficiency of the mechanical department in such a case as this.

There were and are, shop rules which interfere with maximum production and which should be modified in union shops. But there is a great need of friendliness and co-operation instead of the antagonism and distrust which exists in too many cases. Here is where the shop referred to can be studied to advantage and probably copied in many ways. But no increase in either harmony or efficiency can take the place of good machine equipment and adequate handling facilities for material.



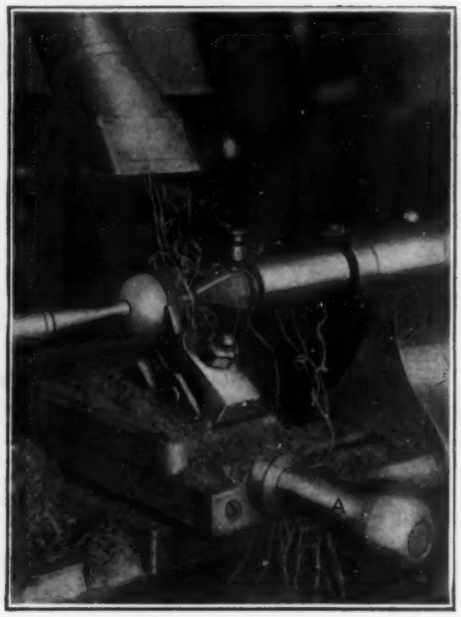


FIG. 1—TURNING THE HARD RUBBER BALLS. FIG. 2—DETAILS OF THE TURNING TOOL

Machining Hard Rubber Parts For Water Meters

BY FRED H. COLVIN
Editor, *American Machinist*

Turning and slotting hard-rubber balls—Automatically facing hard-rubber disks—Diamond tools at high speed —Some assembly operations

THE BALL SEAT, which was so much in evidence in the first article on water meters, was for the seating of a hard rubber ball that forms the axis for the measuring ball and disk in the measuring chamber. Some of the balls are shown in Fig. 1 which also shows the way in which they are turned between centers in a bench lathe. The rough balls are shown in the box at the right, just as they come from the molds, while the finished balls are in the box at the left. There are, however, two turning operations, the finishing cut merely trimming up any imperfections which may have been left by the roughing tool. Diamond cutting tools are used in both cases.

The ball is formed by swinging the tool around a center by means of the handle *A*, in both Figs. 1 and 2. The diameter of the ball is held within very close limits, as both it and the disk must work freely and without leakage. The balls are measured with the micrometer shown in Fig. 1 and also tested for both diameter and roundness by the dial gage to be seen at the left. The ring of this gage supports the ball while being turned under the pointer and the dial gage shows any variations. Details of the tool and the lathe centers are shown in Fig. 2. It will be noted that there is an exhaust pipe directly over the turning tool and that the rubber chips are drawn up into this pipe as they come off. A few drop on the machine but the majority of them escape up the suction pipe together with most of the odor from the rubber.

The balls have to be slotted on three sides to receive the disk plates and this is done in the Garvin milling machine shown in Fig. 3. The fixture shown on the table holds the ball while it is being slotted and indexes it so that the three slots can be cut in proper relation to each other. The ball is held between two cupped plungers, one of which is seen at *A*. The indexing is done by the handle *B*, while handle *C* clamps and releases the ball. Before the last slot is cut, the slide *D* is pushed in under the ball for support. When the ball is released it is brought out on the slide as shown.

The gages used are shown at the left. Gage *E* inspects the width of the slot while the one at *F* gages the thickness of the material left by the milling cutters. The relation of the slot to the outside of the ball is tested by the dial gage at *G*, the slot in the ball sliding over the wings *H* and under the cup above. The ball is then tested for strength in the machine shown in Fig. 4. The slotted ball is slipped over the plates *A*

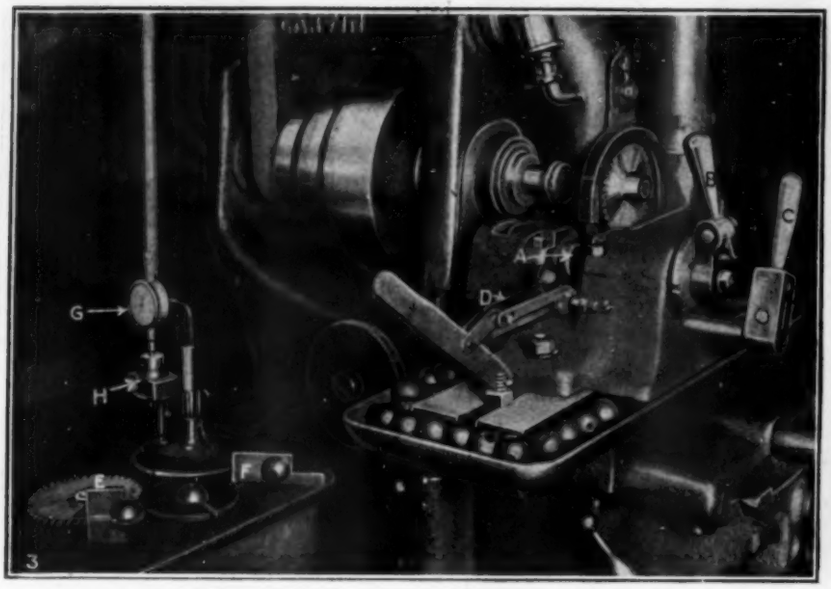


FIG. 3—SLOTTING BALLS FOR RUBBER DISKS.

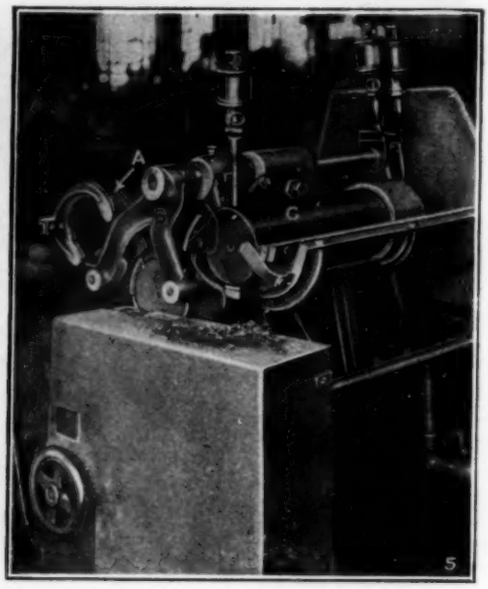


FIG. 5—FACING DISKS IN AUTOMATIC MACHINE

and *B*, the latter being stationary while *A* swings in a bearing at *C*. Pressure is then applied to *A* by means of the lever shown which twists the ball slightly and shows whether it has sufficient flexibility and strength.

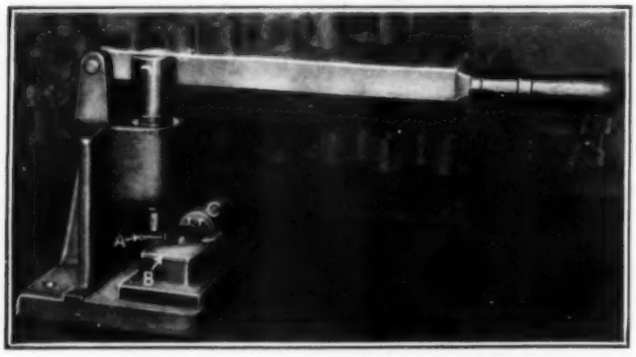
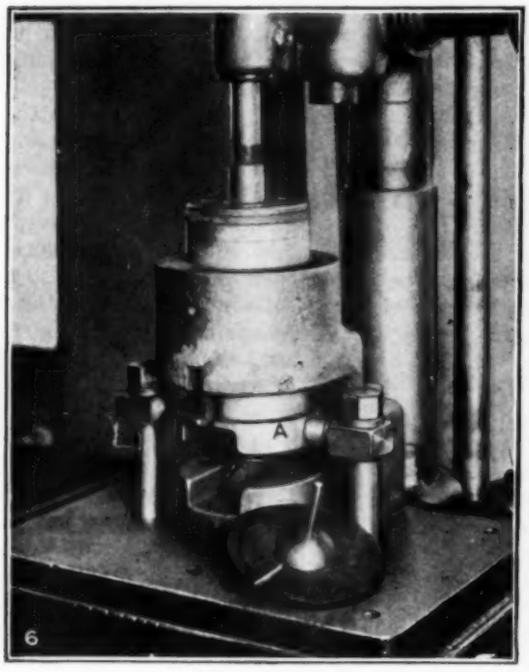


FIG. 4—TESTING STRENGTH OF BALLS

The disk plates which carry the ball are cut from flat sheets and are then placed in the magazine of the machine shown in Fig. 5, at *A*. The forked arm *B* swings to the left and the disks in the magazine are pushed out so that the outer disk slips over a pin in the left arm. The arm then swings to the right and brings the disk in position for chucking. An inward movement places the disk in the chuck, which grips it, and the facing tool commences to travel across the face. The next movement of the feeding arm swings the finished disk up to the finish magazine *C* and at the same time picks a new disk from the rough side and places it in the chuck. Diamond tools are also used for this work, the cutting speed being in the neighborhood of 500 ft. per minute. The disks go through this machine twice, to face both sides, and the thickness is held to very close limits.

After the disks are slotted and the ball assembled,



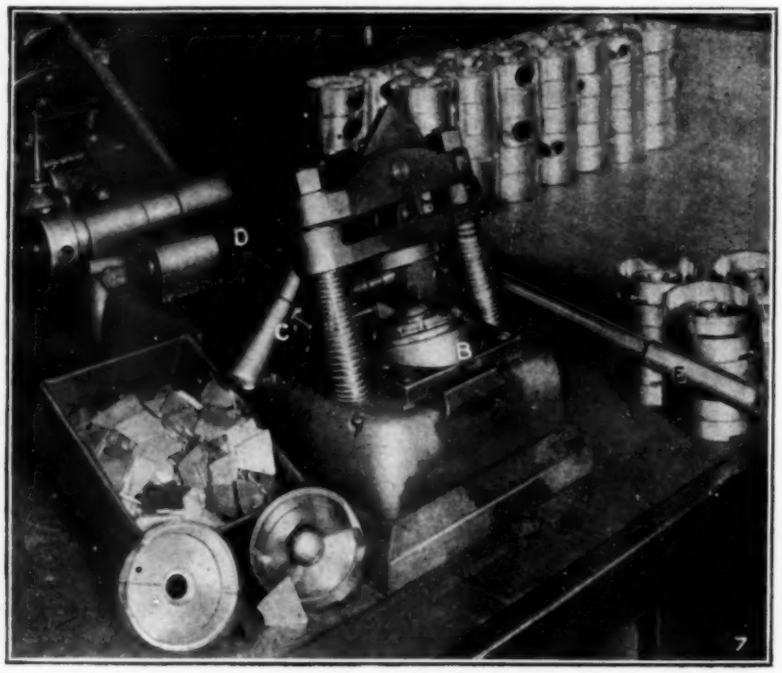


FIG. 6—TRUING STEM IN BALL. FIG. 7—FORCING IN THE DIAPHRAGM

FIG. 8—ASSEMBLED METERING CASES

bronze studs are forced into the center holes of the ball and the ball slipped into place in the disk as in Fig. 6. The assembly here shown is then placed in the holder, the plunger *A* is lowered to hold the disk flat, and the spindle revolved. The spindle carries a hollow burnishing tool which fits down around the bronze stem and straightens it with relation to the disk so that it stands perfectly square.

Going to the measuring chambers once more, we see the forcing in of the triangular diaphragm which divides the measuring chamber into two parts. This piece is forced in with the small press shown in Fig. 7. Both parts of the case and a diaphragm are shown at *A*. The piece is forced into one half the case, which is turned upside down on the base at *B*, and clamped by a single movement of the lever *C*. The triangular piece is placed in the slot and forced in by the toggle *D* at the back, worked by the lever *E*, until it touches the ball shown in the center of the fixture. Before putting the other half of the case into place the rubber disk with its ball in the center is placed in position and the two halves slipped together. The slit in the disk allows room for the triangular piece.

Ball Used for a Gage

In Fig. 8 we see a pile of the cases assembled with the disks in place. It also shows the use of the ball at *A*, for gaging the position of the triangular diaphragm with relation to the rubber ball. In operation, the water enters at one side of this diaphragm, forces the rubber disk to move with a rotating motion with the ball as a center and forces the bronze spindle to revolve as a crank pin with relation to the ball center. This gives motion to the gear train and the register which records the amount of water passing through the meter. It is for this reason that the volume of the chamber must be kept as nearly correct as possible as errors accumulate with every filling and emptying of the chamber. Further details of the meter will be shown in a future article.

Getting Inspiration from Other Machine Shops

By Frank V. Faulhaber

When a foreman has been in charge of a machine shop for a long term of years, and never gets around to see how the other fellow is meeting problems, then the plant he has in charge is not making the progress that otherwise might be possible. One superintendent recently observed: "There is nothing like finding out about other machine shops' methods in overcoming problems. Every foreman I ever knew I advised to visit the other shops, so he could actually observe how things were being solved, whether they were not being attended to more easily and in less time. There is a good deal to learn, too, by watching other men's systems and new plans."

There are many machine shop foremen who rarely think of the importance of this matter. One old machine shop foreman, who was broached on the subject, explained: "I find very little time to devote to other plants. I have to give all my time to the shop in which I am employed, and can spare no minute for outside work."

Benefits Derived from Outside Visits

It may here be said, for the benefit of other executives, that time applied to such outside work is really in the advancement of the machine shop. The foreman who wants to avail himself of the opportunity of consulting the foremen of other plants, should set aside a certain part of the day, every week or two. If the foreman, however, cannot get away from the shop at least every two weeks, then a visit to some plant once a month will be better than none at all. One foreman has solved the problem for himself by turning the shop over to his assistant, while he "scouts for new ideas," as he phrases his regular visits.

By consulting other plants the machine shop foreman will get hold of information which he can secure in no other way. Meetings and an exchange of experiences are always worth-while, yet there is nothing to compare with the actual observance of the other plants' methods. When the foreman has in mind a given new method used in a plant which he would like to adapt to his own purposes, he is often uncertain of the outcome, and this naturally leads to apprehension which deters the test. By considering the other plants which have tried different new methods, and visiting these shops himself, the foreman of course will come face to face with the actual work as it is being produced—he will have before him more than verbal explanations, the results will be convincing, and he will, naturally, be encouraged to try out the new methods in his own shop.

When a foreman in charge of one shop never takes time to see how other shops are meeting problems similar to his own, and the way their work is routed, then, of course, he is using only set methods, and since they are often obsolete, the plant he has in charge is not geting the best possible results. There comes to mind the experience of one machine shop executive who, during one of his periodical visits, witnessed an operation that suggested a change in his own plant. He observed that the shop was processing its work more rapidly because there was more room for the men in which to operate. His own shop was cramped because of a lot of little-used and unnecessary machines, and the results were unsatisfactory. But the visit provided the inspiration that enabled him to effect an improvement in the method of processing in his own plant.

How the Work of the American Engineering Standards Committee Is Carried On

THE American Engineering Standards Committee essays to serve as a national clearing house for engineering and industrial standardization, to act as the official channel of co-operation in international standardization, and to provide an information service on engineering and industrial standardization matters. The ultimate responsibility for and control of the work rests with the organizations whose representatives constitute the American Engineering Standards Committee. The process of industrial standardization may be conveniently divided into four stages, namely: (1) standardization by individual firms; (2) by societies and associations; (3) on a national scale; (4) on an international scale. The A.E.S.C. is primarily concerned with the last two stages. It is the agency through which industrial standardization in this country is passing from the second to the third stage, namely, from standardization by associations, societies and governmental agencies, to standardization on a national scale. Through its method and procedure, which are the result of extensive study and discussion on the part of numerous bodies concerned, and which have been further developed through three years of experience, the standardization work of the many bodies concerned is being broadened and unified into a system of national industrial standards.

The A.E.S.C. method is simply a systematic plan of co-operation by which all organizations interested in any particular standardization project participate (1) in deciding whether the work shall be undertaken at all, (2) in formulating the standardization, and (3) in its ultimate approval as an "American Standard" or a "Tentative American Standard."

The formulation of each standard, including all detailed work and technical decisions, is in the hands of a working committee, called a "sectional committee." The sectional committee is made up of representatives designated by the various bodies interested in the particular project in hand. Each sectional committee is organized by, and under the leadership of one or more of the principal bodies interested. Such bodies are known as "sponsors." This plan makes the Committee the most decentralized of all the national standardization bodies.

Functions of the Main Committee

After the standard has been formulated and agreement upon it reached in the sectional committee, it is submitted, through the sponsor, to the Main Committee for approval. In acting on the approval of standards as "American Standards" or "Tentative American Standards," the Main Committee considers the adequacy of representation on the sectional committee of the various interests, and the procedure which has been followed, but it does not concern itself with the technical details of the standard. Hence, approval by the A.E.S.C. means, not that the Main Committee has itself worked over and passed upon the technical details of the standard, but that it has satisfied itself that all organizations concerned have had an opportunity to participate in the work, that the work has been carried out under a procedure that has been regular, open, and above board, and that the standard represents a real national consensus on what is best in American engineering and industrial practice, and hence that it either already does or may reasonably be expected to play a significant, if not a controlling, rôle in the processes and materials in the industry concerned.

Organization Gone Mad—Discussion

By George L. Markland, Jr.
President, Philadelphia Gear Works

In Vol. 58 of the *American Machinist* page 225, there is an article by Entropy, headed "Organization Gone Mad."

The article is unfortunate in that it strikes a vein of ridicule and says in so many words that the men at the head of various associations, and those holding offices in various associations, have become members solely for the purpose of acquiring an office.

Take John Edgerton, president of the National Association of Manufacturers—he is a forceful man and stands out, and is sought all over the country. Take the American Gear Manufacturers Association—Fred Sinram, the president, is a man who stands out and is sought. True this is an industry association; but take the purely social. Take Lu Lu Temple, the Shrine of Philadelphia—Freeland Kendrick, a man of tremendous personality, dominates the whole institution and is sought all over the country.

Other Social Organizations

Take our own little social organization—the Shrine Club of Philadelphia. John Taylor, the president, didn't seek the job. None of these men have sought the job. Take our own Russell C. Ball, who is our secretary and treasurer. He is the treasurer of three social organizations, successful because he handles the cash. These men didn't deliberately plot their jobs in these associations.

Every industry in the country should have its own organization, and every man in that industry should be a member. There should be a local chamber of commerce in every city. Every industry organization should be a part of a national organization and every local chamber of commerce should be a member of the Chamber of Commerce of the United States. There should be a manufacturers' association in every state, and every manufacturer in that state should be a member of it; and every manufacturer in the United States should be a member of the National Association of Manufacturers.

The Rotary Club is a great social organization, and so, too, is the Kiwanis Club.

I don't know who Entropy is, but he doesn't appear to me to have the proper slant on this subject. You could write many pages, giving the names of men who have dominated various associations and organizations. These men do not deliberately plan to become the heads of these associations. They are sought by their fellow members because of the characteristics which show them to be men fitted for leadership. Business as a whole is not sufficiently organized, and, therefore, their efforts are dissipated.

I wonder to how many associations Entropy belongs.

Standard Jig Bushings

SPECIAL CORRESPONDENCE

Part of toolmaker's work eliminated—System comprises both liner and wearing bushings—Locking method requires the use of neither screws nor pins

IF THE JIG bushings used in various shops engaged in production work could be collected, comparison would show them to be of many sizes and proportions, the one bearing little relation to the other. Toolmakers have never reduced the bushings used in jigs to a standard and it has remained for The Jig Bushing Co., Pontiac, Mich. to take up the work and not only adopt a standard, but to manufacture bushings of several types in a series of sizes that can be used to advantage in the majority of cases.

The various types are shown in Fig. 1, and the system known as the Briney standard comprises the following: Flat head eccentric-lock wearing bushings; knurled head eccentric-lock wearing bushings; eccentric-lock liner bushings; free-lock knurled head wearing bushings; free-lock liner bushings.

The flat head eccentric-lock bushings shown in Fig. 2 are intended to be left in the liner bushings until worn out. They are to be removed for replacement by rotating by use of a punch in the lock-release hole.

The knurled head eccentric-lock bushings are shown in Fig. 3 and are for use where two or more sizes or types of tools are to be used in completing an operation, such as drilling and reaming or drilling and spot facing, which necessitate a change of bushings. These bushings can readily be removed by grasping them by the knurled collars and giving them a slight twist.

The eccentric-lock liner bushings shown in Fig. 4 are for use with both types of wearing bushings.

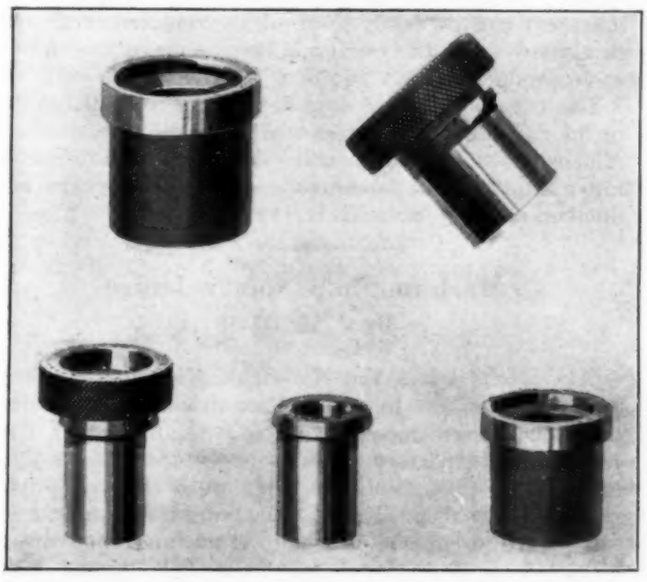
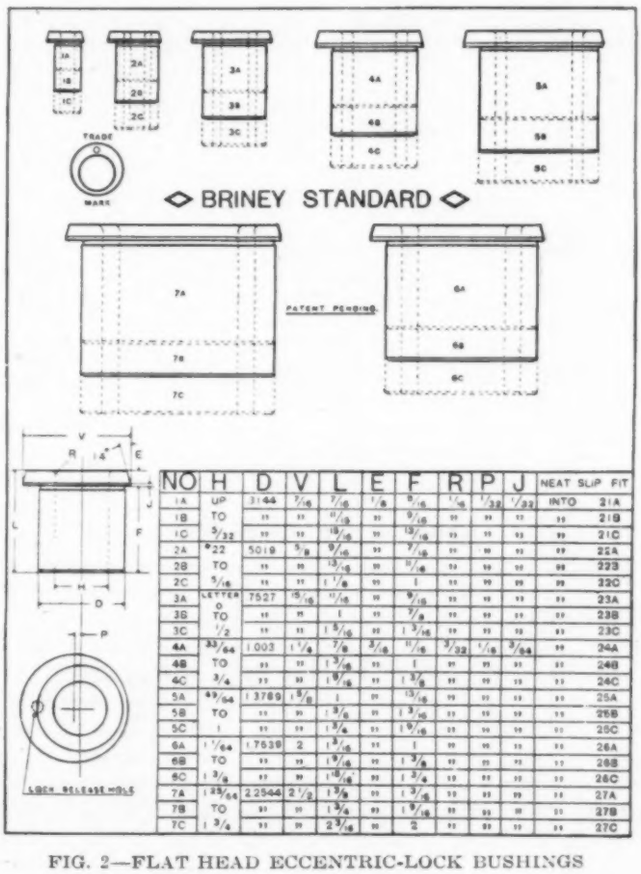


FIG. 1—TYPES OF WEARING AND LINER BUSHINGS

The free lock knurled-head bushings, together with the liner bushings to be used in connection with them, are shown in Fig. 5.

These bushings are to be used for the same purpose as those of the knurled head eccentric-type, the only difference being in the construction of the locking device which can be seen by comparison with Figs. 3 and 4.

As will readily be seen, this system provides a series of both permanent and slip-fit bushings all of which

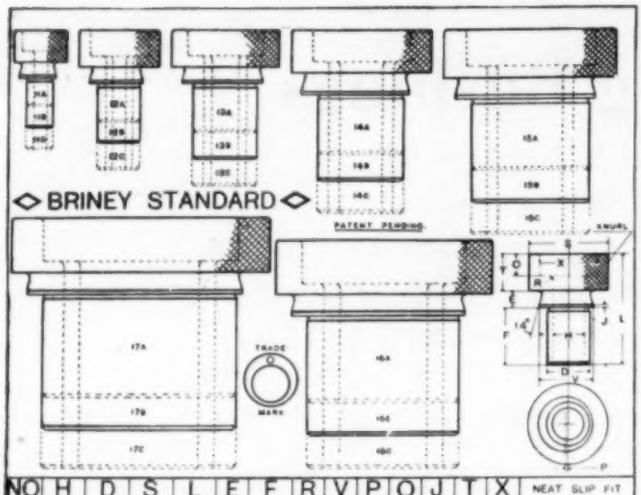


NO	H	D	V	L	E	F	R	P	J	NEAT SLIP FIT
1A	UP	.3144	7/16	7/16	1/8	9/16	1/16	1/32	1/32	INTO 21A
1B	TO	"	"	11/16	"	9/16	"	"	"	" 21B
1C	5/32	"	"	15/16	"	13/16	"	"	"	" 21C
2A	.22	.5019	5/8	9/16	"	7/16	"	"	"	" 22A
2B	TO	"	"	13/16	"	11/16	"	"	"	" 22B
2C	5/16	"	"	1 1/16	"	1	"	"	"	" 22C
3A	LETTER O	.7527	15/16	11/16	"	9/16	"	"	"	" 23A
3B	TO	"	"	1	"	7/8	"	"	"	" 23B
3C	1/2	"	"	1 5/16	"	1 3/16	"	"	"	" 23C
4A	33/64	1.003	1 1/8	7/8	3/16	11/16	3/32	1/16	3/64	" 24A
4B	TO	"	"	1 5/16	"	1	"	"	"	" 24B
4C	3/4	"	"	1 9/16	"	1 3/8	"	"	"	" 24C
5A	49/64	1.3789	1 5/8	1	"	13/16	"	"	"	" 25A
5B	TO	"	"	1 3/16	"	1 3/16	"	"	"	" 25B
5C	1	"	"	1 3/4	"	1 9/16	"	"	"	" 25C
6A	1 1/64	1.7539	2	1 3/16	"	1	"	"	"	" 26A
6B	TO	"	"	1 9/16	"	1 3/8	"	"	"	" 26B
6C	1 3/8	"	"	1 15/16	"	1 3/4	"	"	"	" 26C
7A	1 33/64	2.2544	2 1/2	1 3/8	"	1 3/16	"	"	"	" 27A
7B	TO	"	"	1 3/4	"	1 9/16	"	"	"	" 27B
7C	1 3/4	"	"	2 3/16	"	2	"	"	"	" 27C

FIG. 2—FLAT HEAD ECCENTRIC-LOCK BUSHINGS

are made in one piece and do not require the use of either screws or pins to prevent them from revolving or working out of place

In placing the liner bushings there is no necessity to press them into the jig plate exceptionally tight. The locking device of the bushings, shown in Figs. 2 and 3, comprises an eccentric beveled shoulder on the wearing bushing, which locks in a eccentric beveled recess in the upper part of the liner bushing. The flat head and knurled head eccentric-lock types are con-

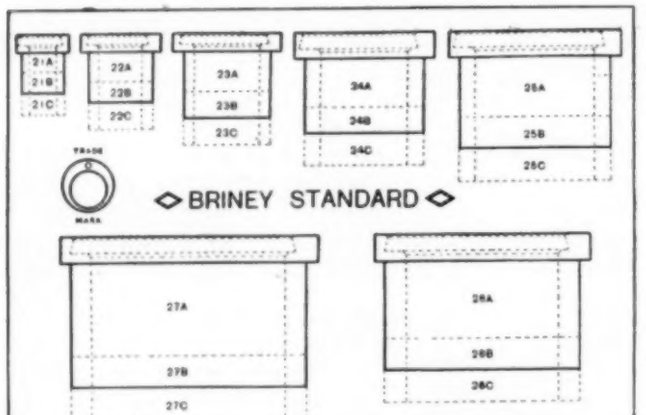


NO	H	D	S	L	E	F	R	V	P	O	J	T	X	NEAT SLIP FIT	
11A	UP	3142	5/8	1/2	5/16	5/16	1/16R	7/16	1/32	1/4	1/32	3/8	7/16	INTO	21A
11B	TO	"	"	1 1/8	"	9/16	"	"	"	"	"	"	"	"	21B
11C	9/32	"	"	1 3/8	"	13/16	"	"	"	"	"	"	"	"	21C
12A	#22	.5017	15/16	1 1/16	"	7/16	"	5/8	"	5/16	"	7/16	11/16	"	22A
12B	TO	"	"	1 5/16	"	11/16	"	"	"	"	"	"	"	"	22B
12C	5/16	"	"	1 5/8	"	1	"	"	"	"	"	"	"	"	22C
13A	LETTER O	.7926	1 1/4	1 5/16	"	9/16	"	15/16	"	"	"	"	7/8	"	23A
13B	TO	"	"	1 1/2	"	7/8	"	"	"	"	"	"	"	"	23B
13C	1/2	"	"	1 13/16	"	1 3/16	"	"	"	"	"	"	"	"	23C
14A	33/64	1.0028	1 5/8	1 1/16	1/4	11/16	3/32	1 1/4	1/16	3/8	"	1/2	1 1/8	"	24A
14B	TO	"	"	1 3/4	"	1	"	"	"	"	"	"	"	"	24B
14C	3/4	"	"	2 1/8	"	1 3/8	"	"	"	"	"	"	"	"	24C
15A	49/64	1.3787	2	1 3/8	"	15/16	"	1 5/8	"	7/16	3/64	9/16	1 1/2	"	25A
15B	TO	"	"	2	"	1 5/16	"	"	"	"	"	"	"	"	25B
15C	1	"	"	2 3/8	"	1 9/16	"	"	"	"	"	"	"	"	25C
16A	1 1/64	1.7537	2 1/2	1 7/8	"	1	"	2	"	1/2	"	5/8	1 7/8	"	26A
16B	TO	"	"	2 1/4	"	1 3/8	"	"	"	"	"	"	"	"	26B
16C	1 3/8	"	"	2 3/8	"	1 3/4	"	"	"	"	"	"	"	"	26C
17A	1 33/64	2.2542	3	2 1/16	"	1 7/16	"	2 1/2	"	"	"	"	2 1/4	"	27A
17B	TO	"	"	2 7/16	"	1 9/16	"	"	"	"	"	"	"	"	27B
17C	1 3/4	"	"	2 7/8	"	2	"	"	"	"	"	"	"	"	27C

FIG. 3—KNURLED HEAD ECCENTRIC-LOCK BUSHINGS

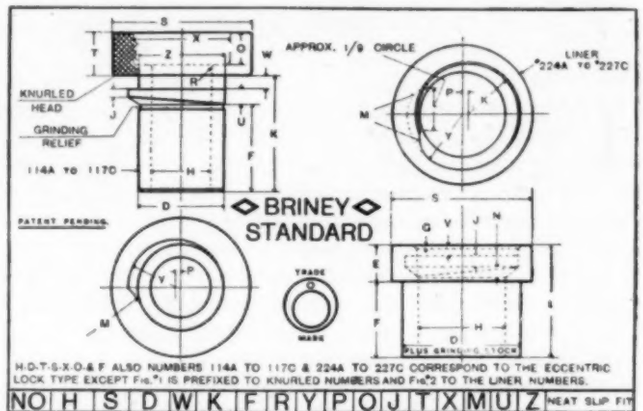
structed with a full eccentric beveled-shoulder which keeps the bushing from either rotating or working out of the liner bushing when in use. The locking device of the free-locking type comprises a beveled eccentric shoulder having a portion of the eccentric machined away as is plainly shown in Fig. 5.

Among the advantages of this system are: The ability to change bushings when desired; that it is not necessary to remove jig plates from the heads of multiple drilling machines when replacing worn bushings; that it eliminates the cost of having a toolmaker replace a worn out bushing, because the change can be made by the operator, inspector or foreman as readily as changing one taper-shank tool for another in the machine



NO	H	D	S	L	E	F	J	V	P
21A	315	1/8	5/8	1/16	3/32	3/32	1/8	15/32	1/32
21B	"	"	"	11/16	"	5/32	"	"	"
21C	"	"	"	15/16	"	23/32	"	"	"
22A	5025	3/4	15/16	9/16	"	11/32	"	21/32	"
22B	"	"	"	13/16	"	29/32	"	"	"
22C	"	"	"	1 1/8	"	49/32	"	"	"
23A	7535	1	1 1/4	15/16	"	13/32	"	31/32	"
23B	"	"	"	1	"	25/32	"	"	"
23C	"	"	"	1 3/16	"	1 3/32	"	"	"
24A	1.0038	1 3/8	1 5/8	7/8	5/16	9/16	3/16	1 13/32	1/16
24B	"	"	"	1 3/16	"	7/8	"	"	"
24C	"	"	"	1 5/16	"	1 1/4	"	"	"
25A	1.380	1 3/4	2	1	"	11/16	"	1 27/32	"
25B	"	"	"	1 3/8	"	1 5/8	"	"	"
25C	"	"	"	1 3/4	"	1 15/16	"	"	"
26A	1.755	2 1/4	2 1/2	1 3/16	"	7/8	"	2 1/32	"
26B	"	"	"	1 5/16	"	1 1/4	"	"	"
26C	"	"	"	1 15/16	"	1 5/8	"	"	"
27A	2.2555	2 3/4	3	1 3/8	"	1 1/16	"	2 7/32	"
27B	"	"	"	1 7/8	"	1 7/16	"	"	"
27C	"	"	"	2 3/16	"	1 7/8	"	"	"

FIG. 4—ECCENTRIC-LOCK LINER BUSHINGS



H-D-T-S-X-O-& F ALSO NUMBERS 114A TO 117C & 224A TO 227C CORRESPOND TO THE ECCENTRIC LOCK TYPE EXCEPT FIG."1 IS PREFIXED TO KNURLED NUMBERS AND FIG."2 TO THE LINER NUMBERS.

NO	H	S	D	W	K	F	R	Y	P	O	J	T	X	M	U	Z	NEAT SLIP FIT	
114A	33/64	1 3/8	1.0028	5/32	1 17/32	11/16	3/32	5/16	1/16	3/8	3/32	1/2	1 1/8	5/8R	3/16	1	INTO	224A
114B	TO	"	"	"	1 21/32	1	"	"	"	"	"	"	"	"	"	"	"	"	224B
114C	3/4	"	"	"	1 25/32	1 3/8	"	"	"	"	"	"	"	"	"	"	"	"	224C
115A	49/64	2	1.3787	"	1 9/32	13/16	"	3/4	"	7/16	"	9/16	1 1/2	"	"	1 3/8	"	225A
115B	TO	"	"	"	1 17/32	1 3/16	"	"	"	"	"	"	"	"	"	"	"	"	225B
115C	1	"	"	"	1 25/32	1 9/16	"	"	"	"	"	"	"	"	"	"	"	"	225C
116A	1 1/64	2 1/2	1.7537	"	1 11/32	1	"	15/16	"	1/2	"	5/8	1 7/8	"	"	1 3/4	"	226A
116B	TO	"	"	"	1 23/32	1 3/8	"	"	"	"	"	"	"	"	"	"	"	"	226B
116C	1 3/8	"	"	"	2 3/32	1 3/4	"	"	"	"	"	"	"	"	"	"	"	"	226C
117A	1 33/64	3	2.2542	"	1 17/32	1 7/16	"	1 5/16	"	"	"	"	2 1/4	"	"	2 1/4	"	227A
117B	TO	"	"	"	1 29/32	1 9/16	"	"	"	"	"	"	"	"	"	"	"	"	227B
117C	1 3/4	"	"	"	2 11/32	2	"	"	"	"	"	"	"	"	"	"	"	"	227C

NO	H	D	S	L	E	F	J	N	G	V	K	P	Y	M
224A	1.0038	1 3/8	1 5/8	1	7/16	9/16	1/8	1/8	3/64	1/8	19/32	1/16	21/32	5/32R
224B	"	"	"	1 5/16	"	7/8	"	"	"	"	"	"	"	"
224C	"	"	"	1 11/16	"	1 1/4	"	"	"	"	"	"	"	"
225A	1.380	1 3/4	2	1 1/8	"	11/16	"	"	"	"	25/32	"	27/32	"
225B	"	"	"	1 1/2	"	1 1/16	"	"	"	"	"	"	"	"
225C	"	"	"	1 7/8	"	1 7/16	"	"	"	"	"	"	"	"
226A	1.755	2 1/8	2 1/2	1 5/16	"	7/8	"	"	"	"	31/32	"	1 1/32	"
226B	"	"	"	1 11/16	"	1 1/4	"	"	"	"	"	"	"	"
226C	"	"	"	2 1/16	"	1 5/8	"	"	"	"	"	"	"	"
227A	2.2555	2 3/4	3	1 1/2	"	1 1/16	"	"	"	"	1 7/32	"	1 9/32	"
227B	"	"	"	1 7/8	"	1 7/16	"	"	"	"	"	"	"	"
227C	"	"	"	2 5/16	"	1 7/8	"	"	"	"	"	"	"	"

FIG. 5—FREE-LOCK KNURLED-HEAD WEARING AND LINER BUSHINGS

spindle. This latter advantage is a vital one, as bushings that can be easily and quickly replaced will often save many times their original cost by preventing a hold up in production.

The tables under the line drawings give full data as to the range of sizes together with all dimensions. The dimensions of the series were decided upon after making a study of the bushings used for some years in a number of large manufacturing plants.

Machine Shop Nomenclature

By J. H. Davis
Wembley, England

At various times the *American Machinist's* editors have made efforts to standardize machine shop names but I do not remember having seen the one which I am mentioning, criticised. I refer to the word trepanning, used on page 969, Vol. 57. This word always reminds me of a paint shop. I don't know why but it appears an ugly word to use to describe a machine shop operation. I prefer the word coring, it seems more descriptive.

Some Recent Developments and Uses for Resistance Welding

By H. A. Woofter
Electrical Engineer for Thomson Electric Welding Company and Thomson Spot Welder Company, Lynn, Mass.

To the average man "Electric Welding" means arc welding. It will be a surprise to many to learn that resistance welding is more generally used in the manufacture of the articles we use every day, than all other methods of welding combined. Its use extends from the welding of the stems on the watches in our pockets, the frames of our eye glasses, the handles on our knives and forks, the rims and frames of our baby carriages, and our automobiles, rims for truck wheels, handles on wrenches, chisels, and hay forks, shanks of mild steel onto high speed drills, reamers, and cutters, chains for all purposes, and of all sizes—in fact, resistance welding is used either directly or indirectly in the manufacture of nearly every metal thing we use. The term "Resistance Welding" as used in this article, applies to seam welding, spot welding and butt welding, whether made by the upset process, flash process, or the new contact flash process. This latter process will be referred to again later.

Taking up the first classification, "Seam Welding," much development work has been carried on within the last two years. Until recently two sheets of No. 20 gage stock was the maximum limit for flat commercial work, while two sheets of No. 18 gage stock could be seamed by previously scarfing the edges. The limit in length of seam for this work was about two feet. Now, however, two $\frac{1}{4}$-in. sheets have been welded on an experimental machine, and the length of seam can be practically anything that can be procured in commercial stock.

It is interesting to speculate upon the advantages offered by this advance in the art of seam welding. It can be applied to the manufacture of steel barrels, casks, tanks, culverts, smoke stacks, ventilators, conveyor tubes, heating and ventilating pipes, etc. For example, if $\frac{1}{8}$-in. steel barrel stock were rolled up and welded in 24-ft. or 30-ft. lengths, then cut up into barrel lengths, heads flanged and circular seams welded, the barrel would then be complete, with the exception of the bung collar, which would be a job for the arc or the acetylene welder.

The seams can be made at the rate of 40 ft. per min. on two $\frac{1}{16}$-in. sheets, and 20 ft. per min. on two $\frac{1}{8}$-in. sheets, without any scarfing, or special preparation of stock. Clean stock free from dirt, scale or rust should be used, for on any except clean stock the roller electrodes foul and pit, making it necessary to clean them after each weld. Also, on dirty stock, seams are irregular, burned through in places and not welded at all in others.

New Information from Research

Taking up the second classification—"Spot Welding"—much experimenting and investigating have been carried on during the last two years. It is now definitely known that the mechanical pressures applied on the hot spot in the past, have not been sufficient to consummate a perfect spot weld. Furthermore, it is now known that so long as the matter of time, current and mechanical pressure applied is dependent on the human element—namely, the operator, the welds will lack uniformity, due to fatigue, inability to judge, inexperience, etc. Accordingly, spot welders are now being designed that will be entirely automatic as regards time and pressure, so that the welder will function in the same way each time, and make all welds alike. Some recent applications of spot welding are welding the outer edges of disk wheels for automobiles, reels for moving picture films, smoke stacks, ventilator pipes, and ventilator covers for ships, automobile bodies, motorcycle side car bodies, pressed steel automobile wheels and many forms of cooking and household utensils.

The third classification, "Butt Welding," may be subdivided into three classes, namely, (1) upset welding, (2) flash welding and (3) contact flash welding, or automatic butt welding.

Different Types of Butt Welding

As regards the first subdivision, it is interesting to note that it is the oldest, or first process of electric welding to be used and was invented by Prof. Elihu Thomson. It seems that the upset welding process is being superceded for most purposes by the second classification, namely, flash welding. The first is made by butting the cold ends of the stock to be welded, and then applying the electric pressure. The second is made by applying the electric pressure before the ends are in actual contact, and utilizing the flash or minute arcs that play between the ends of the stock. This arcing or flashing quickly heats up the adjacent ends to welding temperature, at which time the current is cut off and the ends quickly forced together to complete the weld.

Some advantages of flash over upset welding are less power required, less upsetting or extrusion of stock, burned metal is thrown off in the flash, along with certain gases, greater production (some rim manufacturers in Detroit are flash welding 300 automobile rims per hour constantly) and finally a stronger weld.

Some recent applications of flash welding are welding auto truck wheels rolled up from I-beams with a cross section 10 in. wide by $\frac{3}{8}$ in. thick, train coupler links for England's railroads, drop forged hubs for disk wheels for Cadillac, Studebaker and Dodge cars, flyers for looms, steel welded wheels for Ford cars, duralumin for a multiplicity of uses, and many others too numerous to mention.

The third subdivision, "Contact Flash Welding," is a new invention, soon to be placed on the market. It is in some respects very similar to percussion welding, invented by Mr. Chubb of the Westinghouse Co., but is radically different in others.

The weld is made almost instantly. The nearby metal is not heated and a weld can be handled immediately after being removed from the welder without burning the hands. The contact flash process welds stock 1 in. in diameter at present on an experimental welder and it is expected to weld stock $1\frac{1}{2}$ in. in diameter or larger when a final model is built.

By some of the resistance welding processes, nearly all metals and alloys can now be welded. Tin is the notable exception: It can be welded, but the weld deteriorates so rapidly that it will fall apart the next day, due to what is called "skin disease." Lead, which was formerly very difficult to weld, can now be readily welded by the contact flash process. Stellite, which has been the cause of many disappointments and discouragements in the past, is now being successfully welded and is superseding high speed steel at a much lower cost.

Paper read before American Welding Society, Boston Section, City Club, Boston, Mass.

Brass is in a class by itself since the ease with which it can be welded varies with the copper and lead content of the particular sample being welded. Duralumin, when electrically welded, requires no annealing or treatment, and the weld is as strong as the original metal. Some grades of steel require annealing after welding to maintain normal strength. The cross section of stock that it is possible to weld by the resistance process now seems to be limited only by the electric power available. Already wires as small as electric light bulb filaments as a minimum can be welded, and materials having from 16 to 20 sq.in. cross section as a maximum. However, welders could be built to weld practically any large cross section if power companies were able and willing to supply unlimited power for welding purposes. This, however, they do not seem inclined to do at the present time throughout New England, but in Pennsylvania, Ohio, New York and many other states they are quite willing to co-operate with the manufacturer to the present maximum of power required for cross sections of about 20 square inches.

A special adaptation of the electric welder is seen in the electric pipe heater, which can be used also for heating rods or bars or billets; also the electric rivet heater, which will heat rivets of practically any size for practically all purposes. A still further adaptation of the electric resistance welding process is seen in the electric brazing machines and electric soldering machines which are extensively used in the manufacture of jewelry of all kinds, but especially in brazing of hinges to watch cases and devices on gold rings, pins and badges. The electric soldering machine is extensively used in the manufacture of badges, breast pins, shoe buckles and various other low-priced products.

Personal Element in the Machine Shop

By F. P. Terry

During the past few weeks various contributions have appeared in the *American Machinist* dealing with buying machine tools, selecting machine tools, misapplied machine tools and also the poor P. A. who has been called over the coals, all of which are very interesting reading to the machine shop man, and the *American Machinist* is to be complimented in serving up the goods, thus fulfilling its mission in life.

Reading these contributions has convinced me that except in specialized shops the buying, selecting and use of machine tools must always depend a good deal on the personality of the proprietor who is paying the piper, and the machine shop superintendent or foreman who does the piping. Some fifteen years ago, the superintendent of a prominent British firm ordered for a special purpose a large engine lathe from a well-known American firm, whose advertisement appears every week in this journal, the price running to over $5,000. He was a clever man where machine tools were concerned, and his firm had no hesitation in getting him what he wanted. Unfortunately, before delivery could be given this superintendent passed away. In due course the lathe was delivered, and the new superintendent, another clever man, wouldn't have it under any consideration. Negotiations were opened up with the makers, who were quite willing to do their best to dispose of it but obviously they could not take it back to America, and, after lying for some months in the firm's stores, it was disposed of at about half price as a bargain. The writer got that bargain, and didn't enquire of superintendent number two his objections to it to save time and argument. We soon had the lathe at work, and presently added a companion one, although the work we were doing was entirely different to what the lathe was originally purchased for. A few months later, superintendent number two, after demonstrating successfully that he knew his business, left for a "better hole" with another firm and made room for superintendent number three, another clever man. Naturally the latter heard of my bargain, and very soon, partially out of curiosity and partially because he knew the dead man's judgment was never very far from wrong, he paid me a visit to inspect the monstrosity. After spending most of the day with me he was more convinced than ever of the lathe's usefulness, and very soon a replace order went along to the American firm.

A short time ago I received a visit from a young director of this firm, and naturally I recalled the incident. He informed me that they now have three of the lathes in use, also what was really startling, that superintendent number two gave them a call just after the second one was started, and in his firm now, of which he is a partner and director, they have six of the lathes at work.

This story, only one of many I fear, shows that prejudice can be found in really clever machine shop men and against good machine tools, often to the disadvantage (although not in this case) of the machine tool maker, and it is almost impossible to remove it. Much also occurs from want of knowledge, but this can, if the ignorant will read, be overcome much easier. The most difficult of all is the proprietor who believes in being his own P. A. while he pays the piper. Many machine shop foremen are quite willing to allow him to call the tune for personal reasons alone, although they know that better machine tools are being made and advertised, proving over and over again that the "personal element" must always be considered. It cannot be overlooked. Perhaps it is better so.

Solders for Aluminum

Circular No. 78 of the Bureau of Standards entitled, "Solders for Aluminum," has recently been revised. It will soon be available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5c. a copy.

Most of the metals commonly used in solders, except magnesium, are electro-positive to aluminum, so that any metals used in making a soldered joint of aluminum act electrolytically in the presence of moisture as positive galvanic poles accelerating the corrosion of the aluminum. Magnesium cannot be utilized advantageously even though it is electro-negative to aluminum because the metal disintegrates rapidly in the presence of moisture. Therefore, soldered joints of aluminum which are to be exposed to moisture should be protected against corrosion by paint or varnish. Various compositions of zinc-tin and zinc-tin-aluminum solders give the best results.

The tensile strength of a good aluminum solder is about 7,000 lb. per sq. in., because those with higher tensile strength usually have such a high temperature of complete liquidation that they are unsuited for soldering purposes. As a rule, the strength of an aluminum soldered joint depends upon the type and workmanship.

How a Leather Belt Transmits Power

BY J. EDGAR RHOADS* AND DR. R. R. TATNALL†

The factors affecting power transmission—Forces acting on a belt—The effect of centrifugal action on a running belt—change in length, creep and slip

MOST OF THE users of belting probably look upon this equipment as one of the simplest forms which they have in their plant. It is perfectly obvious that if a belt is put around two pulleys and power is applied to one of them by a shaft, the belt, if of proper size and under suitable tension, will make the second pulley rotate, in turn driving the shaft and machinery as desired. Nothing could seem easier, and for three generations the use of belt has grown and has spread into nearly every industry.

Few forms of mechanical equipment have required so little attention; few have cost so little in comparison with work performed. It is a common thing for belts to travel 100,000 miles or more in a year, and many have done several times that and have kept it up year after year. There are in fact records of belts which have run during their life several million miles.

Let us consider step by step the various factors having to do with power transmission. The act of putting the belt on the pulleys under tension causes the belt to stretch. The stretch is partly elastic, and partly inelastic. The elastic part of the stretch gives the belt a tendency to contract again, thus causing grip or traction on the pulleys which is necessary for transmission of power, and causing also pull on the journals, which means journal-friction with loss of power. The inelastic part of the stretch is due to a slippage of the leather fibers on each other, and this slip is not recovered when the tension is removed. This means slight internal friction, and some slight loss of energy, which appears as heat in the belt.

Some of these forces which we will consider seem to be a comparatively small proportion of the total forces acting on the belt, and yet under certain conditions, as

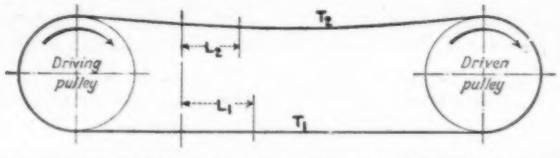


FIG. 1—CENTRIFUGAL ACTION ON A RUNNING BELT

in the case of centrifugal force at very high speeds, they may exert a very large effect upon the bahavior of the belt.

Now start the belt running, but without load. The new features are the effect of stiffness of the belt and the effect of centrifugal force. The stiffness of a belt causes internal friction at all points where the belt bends or unbends. This generates heat and means some lost energy. Centrifugal force acts on every particle of leather that is moving in a curved path, as around the pulleys or in the sag. This causes centrifugal tension in the whole belt.

Fig. 1 shows a belt passing around two pulleys and is intended simply to illustrate the fact that every particle of belt while going around the arc of the pulleys has a definite tendency, due to centrifugal force, to fly away from the pulley and thus lessen the grip or traction of the belt on the pulley. It is necessary to have a certain tension on the belt to get this tractive effect, which is caused by the grip of the leather on the pulley. Owing to centrifugal force, it is also necessary, especially at high speeds, to increase the initial tension sufficiently to overcome this tendency of the belt to fly away from the pulley.

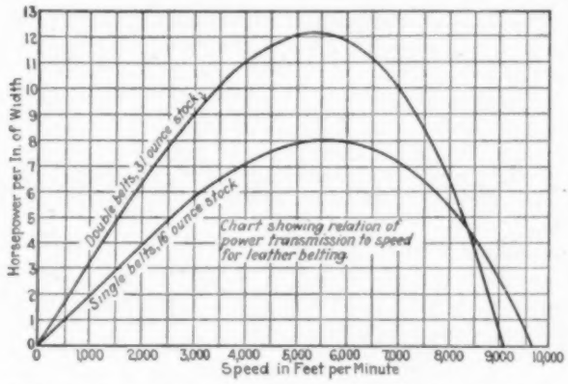


FIG. 2—CHART SHOWING RELATION OF POWER TRANSMISSION TO SPEED

The centrifugal tension is added to the tension already in the belt, causing it to stretch more and to stand off from the pulleys. This has the effect of not only reducing the traction on the pulleys, but also of reducing journal friction.

The amount of centrifugal tension depends on (*a*) weight per foot of the belt—doubling the weight per foot doubles the centrifugal tension, (*b*) the speed of the belt, and is proportional to the square of the speed—doubling the speed multiplies the centrifugal tension four times.

At extreme speeds, the centrifugal tension may become equal to, or greater than the original tension, in which case the belt may be seen to stand off from the pulleys, touching them only at the top where its weight is supported. Under these conditions little or no power can be transmitted.

Abstract from a paper presented at a meeting of the Leather Belting Exchange.

*Member J. E. Rhoades & Son, Chairman Research Committee of Leather Belting Exchange.

†Experimental Engineer J. E. Rhoades & Son.

Fig. 2 shows two theoretical curves, based upon data secured from a 16-oz. belt running under certain conditions of tension and speed. It illustrates the fact that if no changes are made in the tension except those produced by centrifugal force, at the higher speeds the power begins to fall off rapidly and that at extremely high speeds, such as 8,000 or 9,000 ft. per min., no power would be transmitted. It would of course be possible to transmit some power at even these excessive speeds by very materially increasing the initial tension upon the belt.

As an illustration of such a very high speed and difficult drive, let us take a 32-in. double belt weighing 30 oz. per sq.ft. and running at 5,000 ft. per min. and carrying a load of 750 hp. (a very severe overload). The tension on the tight side of the belt, which is doing the pulling, would be 6,162 lb. and on the slack side it would be 1,212 lb., assuming a coefficient of friction of 0.8. The centrifugal tension of each side is 1,077 lb. and the pull on each shaft bearing 5,220 pounds.

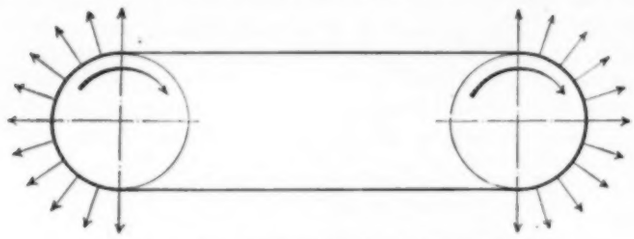


FIG. 3—DIAGRAM SHOWING EXPLANATION OF CREEP

Now consider the case of the same 32-in. belt running at the extreme speed of 7,500 ft. per min. and transmitting 1,100 hp. Look at the table and note how much higher the tensions all are.

32-IN. DOUBLE BELT (30 Oz.)

Speed Ft. per Min.	Load, Hp.	Tension (T_1) On Tight Strand When Carrying Load	Tension (T_2) On Slack Strand When Carrying Load	Centrifugal Tension (Tc) on Each Strand	Pull on Each Bearing
5,000	750	6,162	1,212	1,077	5,220
7,500	1,100	7,692	2,852	2,426	5,692

Centrifugal effects tend to make the belt keep the same shape it would have at slow speeds; not to make it fly out into a circular shape, or follow around the pulley. This latter effect, where observed, is due to stiffness—never to centrifugal force.

Running Under Load

When a load is applied the important additional factors are changes in length, creep and slip. When transmitting power, there must be a tight and a slack side. A given section of belt is stretched more on the tight side than on the slack side. Therefore this section is longer when passing onto the driving pulley than when passing off. The reverse is true at the driven pulley. The change in length must take place while on the pulleys and is called *creep*.

Fig. 3 is intended to show the fact that on account of the elasticity of leather, there is actually a different speed in the particles of belt traveling on the tight side from that which exists on the slack side. We have actually observed a difference of over 1 per cent between the speed of the slack and tight sides of the belt, near the point where the belt leaves the pulleys. The actual amount of creep observed in a belt running under very light load is very small and at light loads the particles are probably only slipping upon the surface of the two pulleys for a few degrees of the arc of contact on the pulley.

The region in which creep takes place probably begins at the point where the belt leaves the pulley, and extends backward as the load is increased, finally covering the entire arc of contact. At this point *slip* begins, that is, in addition to the creep, the belt as a whole begins to slip on the pulley all around the arc of contact. Speed of slip increases with increasing load, and when excessive, the belt may run off the pulley.

Transmission of Power

The two factors of power are speed and pulley traction or grip. You can transmit more power by running the belt faster. Except for the centrifugal effect, the power would be proportional to the speed—twice the speed would give twice the power. But since the unfavorable effect of centrifugal action is proportional to the square of the speed, this soon over-balances the other, and beyond a certain point, power begins to decrease as the speed increases.

Since the centrifugal effect depends on the weight of the belt, it is advantageous to use the lightest stock and the thinnest and narrowest belt compatible with sufficient strength and reasonably long life.

The second factor of power is *grip* or traction. This is the same as the frictional force of the pulley on the belt, and is equal to the difference of tension between tight and slack sides ($T_1 - T_2$). The friction does not depend on the width of the belt, but does involve: (*a*) the character of surface of belt—kind of leather, tanning, currying; (*b*) the pulley surface—iron, steel, wood or paper; (*c*) the tension of belt, because this produces pressure of belt on pulley—the greater the pressure, the greater the traction; (*d*) the arc of contact—the friction increases very rapidly with the arc of contact, so that a small increase in arc gives a large increase of friction; and (*e*) the speed of creep and slip—friction between belt and pulley increases as the speed of slip or creep increases. In other words, the grip of the belt on the pulley is better when slipping, and the faster the slip the better the grip, up to a certain point. Evidently this condition must be true, else after slip begins, you could not get more power—the belt would simply slip faster.

Horse-power (P)	$T_1+T_2-2T_c$	T_1+T_2	T_1-T_2	T_1	T_2	$\frac{T_1}{T_2}$	Coeff of Friction (f)	Slip, % (S)
15.1	175	409	199	304	105	2.89	0.38	0.77
19.4	391	425	256	341	84	4.06	50	1.04
23.8	410	444	314	379	65	5.83	65	1.34
26.7	430	464	352	408	56	7.29	73	1.53
29.6	447	481	389	435	46	9.45	85	1.72
32.0	477	511	422	467	44	10.6	89	1.92
34.8	504	538	459	499	39	12.8	98	2.12
37.5	540	574	495	535	39	13.7	1.00	2.33
39.0	555	589	515	552	37	14.9	1.04	2.49
41.9	590	624	553	589	35	16.8	1.10	2.85

FIG. 4—DATA FROM A TEST OF A 4-IN. SINGLE LEATHER BELT, RUNNING AT 2,500 FT. PER MINUTE

The above statements will now be illustrated by data from an actual test.

A 4-in. single leather belt was run at a speed of 2,500 ft. per min. and made to transmit a load of 15.1 hp. (Fig. 4). The centrifugal tension at the speed was known to be $Tc = 17$ pounds.

In the table, the first two columns and the last one, are *observed*, that is, obtained directly from the testing machine. The remaining six columns are *computed* from the data in the first two.

The tension shown by the testing machine, or the pull on the journal, was

$(T_1 - Tc) + (T_2 - Tc) = T_1 + T_2 - 2Tc = 375$ lb.

If the belt had been running slowly, so as to have no appreciable centrifugal tension, the journal pull would have been 34 lb. more, or 409 lb. This is the sum of the actual tensions in the two strands of the belt, or $T_1 + T_2$.

Knowing the power and speed, we can calculate the difference in tensions $(T_1 - T_2)$, and also the separate tensions in the two strands, which are T_1 and T_2. Thus, while transmitting 15.1 hp., the belt had a tension on the tight side of 304 lb., and on the slack side of 105 lb., as shown in the first line of the above table. $T_1 - T_2$ is the traction of the belt on the pulley, and is proportional to the power transmitted.

The ratio of the tight to the slack tension, T_1/T_2, can have almost any value. When there is no load $T_1 = T_2$, so that $T_1/T_2 = 1$. As the load increases, the ratio T_1/T_2 increases and may reach a very large value. Each value of T_1/T_2 corresponds to a definite value of the coefficient of friction. (Coefficient of friction is calculated from the ratio of the tensions by means of the formula $(T_1 - Tc)/(T_2 - Tc) = fa$. log $e = 0.4343\ fa$, in which (f) is the coefficient of friction, and (a) the arc of contact in radians).

It may not be out of place to explain here the meaning of the term *coefficient of friction*. Suppose a strip of leather laid on a table, and a block of iron placed on the leather and drawn along its surface by means of a spring balance attached to the block. The reading of the balance, that is, the force required to keep the block slipping, is called the *friction* between the iron and the leather. The *coefficient of friction* is the ratio of the friction to the force which presses the iron against the leather. To illustrate: if the block weighs 20 lb., and the pull necessary to make it slide is one-quarter of this, would be $5/20 = \frac{1}{4} = 0.25$.

The largest value of T_1/T_2 which we have so far obtained is about 70/1, corresponding to a coefficient of friction of 1.35.

The Effect of Increased Load

In the table, the coefficient of friction and slip are both given, and it will be noticed that they both increase with the load. Evidently the increase in coefficient of friction is caused by the increased slip, since there is no other factor which is changing enough to account for it. After about 44 hp., in this test, the friction no longer increases, and may even diminish. This may be near the point at which true slip begins. If so, it would indicate that the change in friction is due to creep rather than slip.

The table further shows that the coefficient of friction increases as the slip or creep increases. This property of leather belting, which gives an increase in its pulling power as the slip increases, is a most interesting and valuable property, and one whose significance has only been appreciated for a very short time. It is this property which gives to leather belting, which has been properly tanned and curried, its wonderful capacity for carrying enormous overloads above the normal rating of the belt. With the best belts this reaches a point well over 100 per cent of its normal rated capacity.

In this connection, we would like to point out that within the last few years, improved methods of tanning and currying adopted by the most progressive manufacturers, have resulted in its being possible for a properly made leather belt to be rated for ordinary purposes at a materially higher figure than was generally considered safe a few years back. The improvements, chiefly to the surface of the leather, have resulted in conservatively estimating the capacity of a given leather belt at about ⅓ more than was general 5 years ago.

Measuring the Elasticity of Belts

Some very interesting work on the elasticity of belts in relation to creep and power transmission has been done by Prof. W. M. Sawdon and Mr. R. F. Jones at the Sibley College of Engineering at Cornell University. Professor Sawdon designed a most ingenious machine for recording the elasticity of a strip of leather, or other belting material. The apparatus tests measured strips of the belt in question. The elongation is recorded both during the application and release of the strain, and by a card drawn by an indicator, working somewhat like an engine indicator, a curve is shown which shows the stress on the belt as it is pulled out, the amount it elongates and the behavior as it shrinks when the stress is removed. One of the very interesting features is that there is a slight time lag in the shrinkage of the material, and a careful measurement of the curves plotted, makes it possible to calculate in a comparative way the energy lost within the belt itself due to stretching and shrinking. The leather belt seems to show a more perfect elasticity than some, and probably than most or all, of the fabric belts. As a result, there is less actual waste of energy in the leather belt during the operation of the creep when it is carrying a load than in other types. As a properly prepared leather belt is more pliable than many of the fabric belts, there is less loss of energy in this respect also. From a power standpoint, however, the main saving obtained through the use of the best leather belt as compared with most fabric belts, is that the leather belt can run with a larger proportion of the tension on the bearings doing effective work. There can be less tension upon the slack side of the belt, consequently less waste of energy through bearing-friction. On some drives this is a very large factor indeed, one which probably would of itself justify investment in the best type of leather belt at a much greater first cost, entirely disregarding the fact that the leather is usually a much longer lived belt.

Carburization of Steel

An investigation of the effect of the quality of steel upon its carburizing properties and particularly its hardening properties after carburization was suggested to the Bureau of Standards by commercial metallurgists as a problem of very considerable commercial importance. In order to obtain a wider expression of opinion on this matter, a circular letter was sent to approximately 100 prominent metallurgists. The replies which have been received all indicate the desirability of carrying out such an investigation and the practical importance which the results would have. As soon as the necessary material (abnormal steels) can be obtained, the work will be started.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Double-Equalizing Rotating Drilling Fixture for Meter Cases

BY W. F. SANDMANN

A prominent electrical company, manufacturing meters for residence use, has solved the drilling problem presented by its meter case in the way described in the following paragraphs.

The case, shown at *A* in Fig. 2, was a frail casting and had only the fins ground off when it came up for the drilling operation. As the works of the meter were held in this case very snugly by means of screws through the holes to be drilled it was important that these holes be located accurately. As all locating was from unfinished surfaces it was necessary to equalize inside of the round bowl of the case and square the case up by equalizing on the sides of the box at *B*.

Fig. 1 is a plan view of the completed fixture mounted on a rotating table, showing the six stations with a case in place at one of them. A Natco multiple drilling machine is used for the operation. On account of the proximity of the holes *A* only one hole of each of the pairs can be drilled at a time. The method of drilling is to load two cases at the front of the table at *B*, index the table 120 deg. so that the two cases come to the position *C* and there drill one of the small holes *A* on either side and the hole *D* in two cases at a time. While this drilling is being performed two more cases are being loaded at *B* and when the drilling is completed the table is once more indexed 120 deg. and the remaining holes on either side of the cases are drilled at *E*.

Then the table is again indexed 120 deg. and two completely drilled cases removed and two undrilled ones put in their places. Stations *C* and *E* are under the head of the machine in the drilling position while station *B* is for loading and unloading purposes.

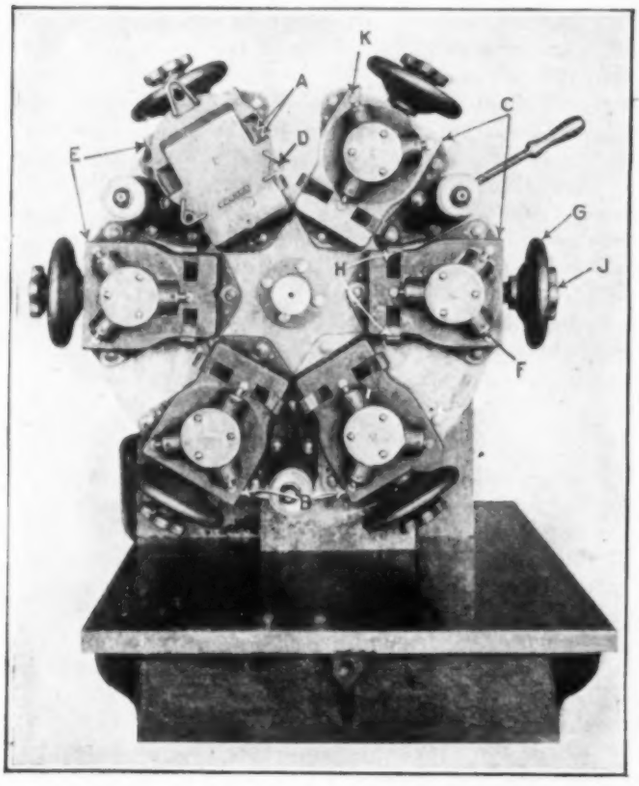


FIG. 1—PLAN VIEW OF SIX-STATION JIG

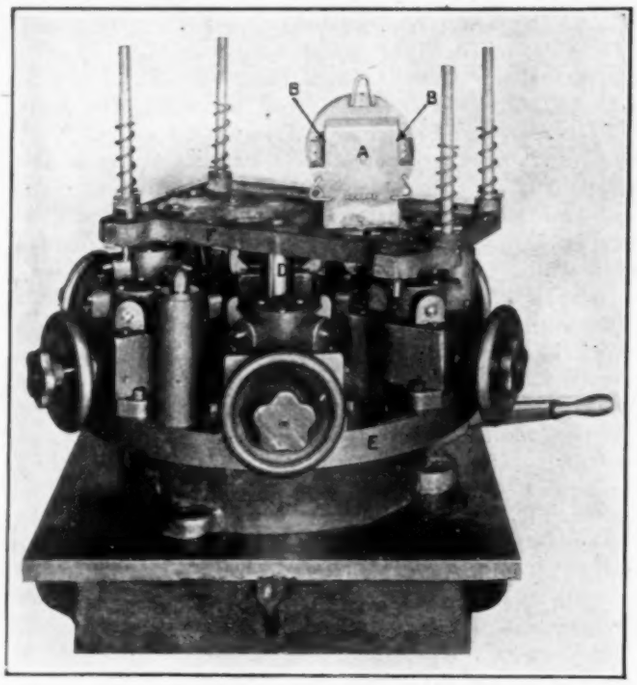


FIG. 2—SIDE VIEW OF JIG AND WORK

The fixture consists of six separate, identical holding devices mounted on a base plate which is doweled to the rotating table. Each one of these holding devices has three pointed equalizing pins, *F*, Fig. 1, which are spread by the turning of the handwheel *G* thereby centering and holding down the case. The jaws *H* square the case up with the radial center line and are operated by handknob *J*. The case rests on three hardened pins *K*. The case is placed on these pins, the handknob *J* turned until tight. The handwheel *G* is then tightened and the case is located and clamped ready for the drilling. The equalizing and clamping effect obtained by tightening the handwheel *G* is sufficiently greater than that obtained by turning the handknob *J* to pull the case far enough radially to square and centralize it even after *J* is tight.

The sketch, Fig. 3, is a cross section of a holding device showing clearly the method of applying the clamping and locating pressures. The shank in the

handwheel *G* is threaded and screws through the casting *L*. It is conical at the end so as to impart a wedge lifting action to the pin *M*, which also has a conical end and spreads the three pins *F* outward equally. These pins are set at a slight angle so as to have the necessary downward pressure to hold the case in place. When the handwheel is released the pin *M* lowers from its

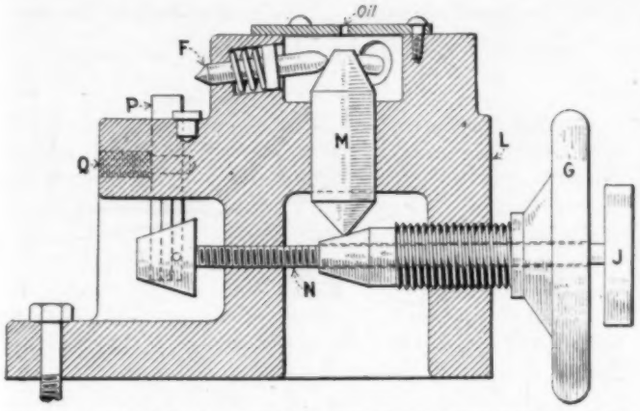


FIG. 3—SECTIONAL SKETCH SHOWING HOLDING PARTS

own weight assisted by the pressure of the springs behind the pins *E*.

The rod of the handknob *J* passes through a clearance hole in *G* and is threaded through a portion of the casting at *N*. It has a cone pinned on its end which spreads and forces the jaws *P* apart at the bottom and together at the top, in that manner squaring up the meter case. When the handknob is backed out the jaws will release slightly through the distribution of their weight around the pin *Q* which forms their axis.

The plate *F*, Fig. 2, contains the drill bushings and is suspended from the head of the Natco by the four rods, rising and falling when the head of the machine is raised and lowered. The plate locates in each position over the conical dowels *C*, two of these dowels entering bushings in the plate in either position. The pin *D* in the center is merely a support for the plate. *E* is the standard type rotating and indexing table.

When loading and unloading this fixture the operator manipulates two holding devices at the same time, one with either hand. A very high production is obtainable.

Kinks for Obtaining Odd Measurements

BY ATOL MAKER

One of the important qualifications of a practical toolmaker is his ability to take precise measurements and make exact locations of unusual pieces in the shortest possible time consistent with accuracy. Here are a few kinks to which I have had recourse when ordinary means of measuring were not available.

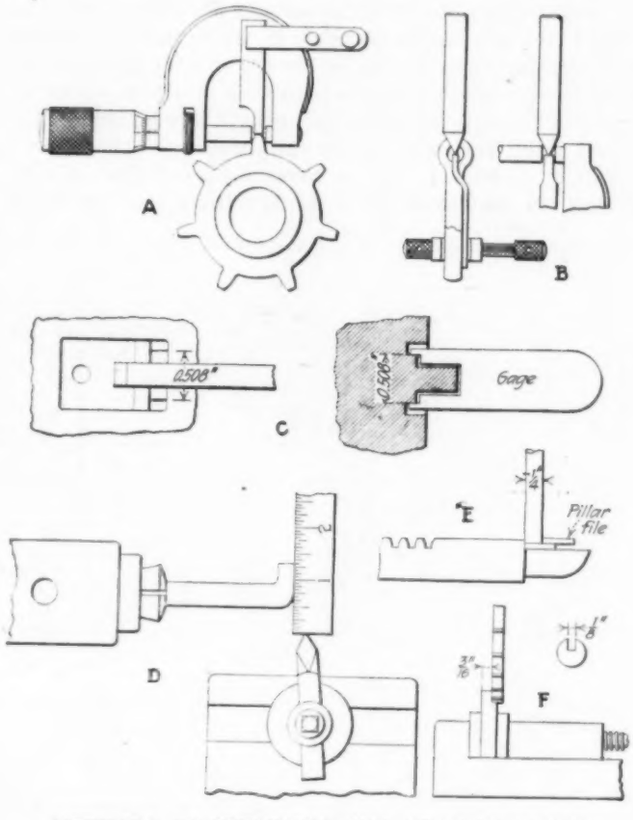
To measure the thickness of a sprocket tooth at the pitch circle when there is no vernier gear-tooth-caliper at hand, an ordinary micrometer may be used by clamping to the frame a small piece of flat ground stock shaped as shown at *A* in the sketch, and adjusting the end of the stock to the right distance below the edge of the measuring spindle by means of a micrometer depth gage.

At *B* is shown the end view of the same arrangement as applied to measuring the diameter of a tapered or conical surface at a given distance from the end, as in making small angle mills and other conical or tapered tools.

At *C* is shown a projection in a die for making die castings, which projection is so located at the bottom of the die as to be inaccessible to a micrometer or other standard measuring tool. I quickly filed a sheet metal gage to fit over the projection and then easily checked the gage, thus verifying the thickness of the projection in a very simple way.

In making dies for die casting I frequently have occasion to use single toothed cutters, or mills, such as the one shown at *D*. If I have a few thousandths tolerance I measure the diameter of the circle such a tool will cut with a scale, by running the lathe tool to the position shown without disturbing its setting after tooling a fine cut, and resting the scale against the point of the tool.

At *E* is a simple method that enabled me to file a lug on a core so that it measured exactly ¼ in. from a shoulder. I rested a piece of ¼-in. drill rod against the shoulder and with the safe edge of a pillar file against the drill rod I quickly filed away the surplus length.



METHODS OF OBTAINING ODD MEASUREMENTS

To locate a keyway central in a round piece that is to be held in a milling machine vise, I first put a piece of scrap in the vise as at *F* and mill away the stock with the same splining cutter that is to be used on the work until the thickness of metal remaining between the cutter and the stationary jaw of the vise is correct, thus: If a ⅛-in. keyway is to be milled in a ½-in. shaft, the remaining thickness should be $\frac{7}{16}$ in., and is easily measureable with a micrometer. The setting of the table must not, of course, be disturbed when changing from the piece of scrap to the shaft in which the keyway is to be milled.

Inspecting and Straightening Connecting Rods

By Herbert F. Crawford

The Pierce-Arrow method of inspecting and straightening connecting rods involves the use of an interesting fixture and gage. Both the fixture and gage are used before any machining operation on the connecting rod forging takes place, and the method has been found very satisfactory in every way.

The fixture, Fig. 1, consists of a substantial cast-iron base *A* having a total length of 25 in., and carrying uprights in which mechanisms for clamping and straightening are mounted. The straightening fixture is supported on a ribbed casting, shown at *B*, through which the straightening screw is operated by means of the handwheel *C*. The plan view above shows how the jaws *D* and *E* clamp the bolt bosses on the large end of the rod, while the portion that is to form the rod cap is positioned by the piece *F*.

With the rod firmly held by its large end, the small end can be bent upward by means of the screw attached to the handwheel *C*, or downward by turning the handwheel *G*, forcing down the cross arm *H*. The cross arm carries a hardened steel block *I*, which makes contact with the forging, acting either as a stop against upward movement by the straightening screw below or as a ram in forcing the rod down, should this be necessary.

The gage for testing the alignment of the rod is shown at *J*, Fig. 1, and in more detail in Fig. 2, consists of the aluminum block *A*, carrying a stud on which the spool *B* is mounted. The flanges of the spool represent the piston bosses and show whether the metal on each side will clean up or not. Below the spool is a helical spring *C*, and above it an adjusting nut *D*, so that the spool can be set in any desired position vertically. Both the stud and the spool are of tool steel, hardened and ground. The aluminum base also carries three hardened and ground steel buttons or feet as at *E*.

With the spool adjusted to the proper height for the

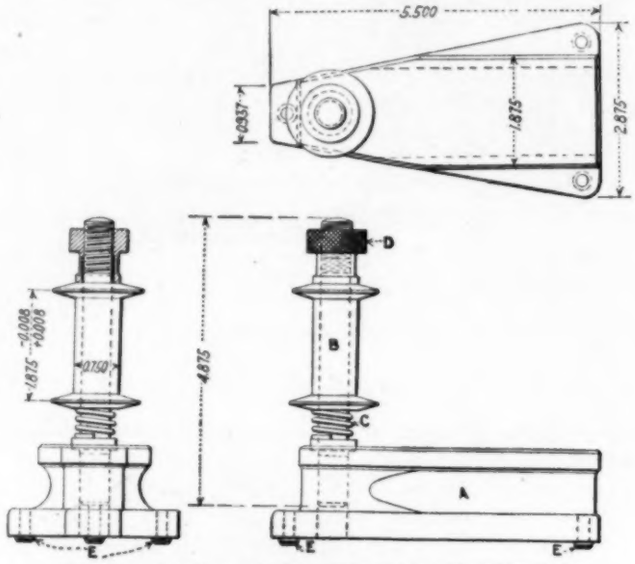


FIG. 2—SIMPLE INDICATOR FOR INSPECTING ROD FORGINGS

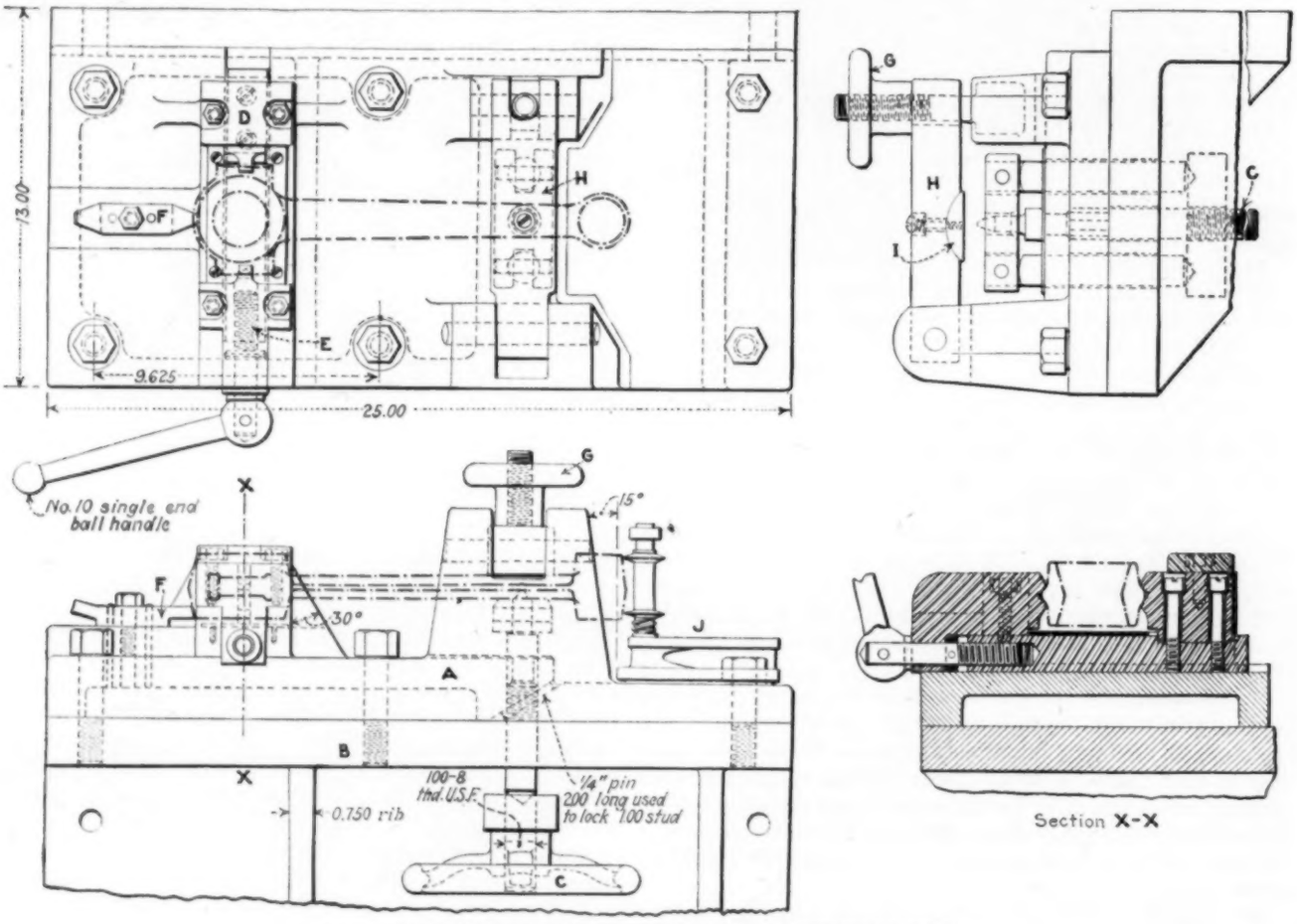


FIG. 1—STRAIGHTENING FIXTURE FOR CONNECTING ROD

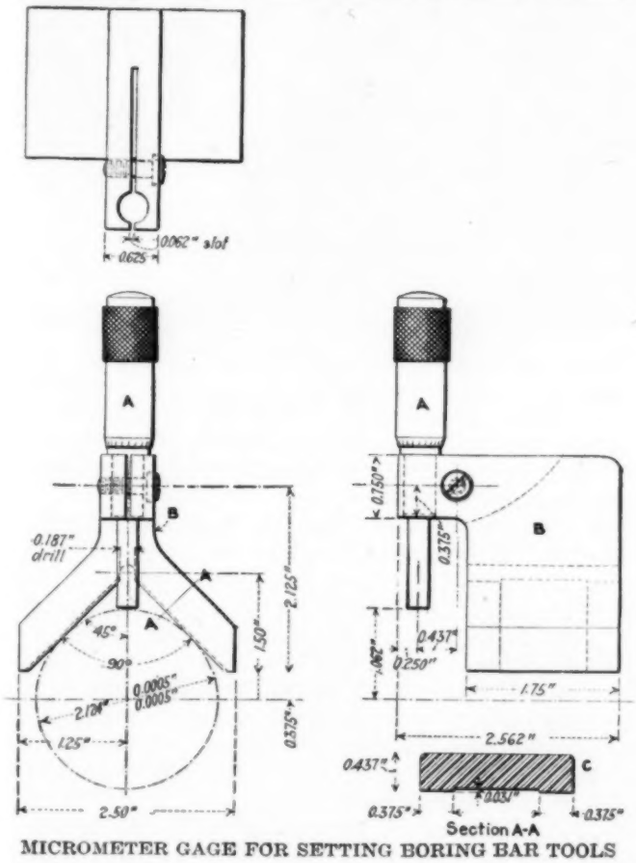
rod being tested, it is placed on the planed surface of the face of the straightening fixture, as shown at *J*, Fig. 1, and tells at a glance which way the rod needs to be bent. This test is, of course, only a rough one for the connecting rod forging, and not for the finished piece, but it makes a very rapid method of both testing and correcting distortion of the forgings at the same handling.

Gage for Setting Boring Bar Cutters

BY I. B. RICH

The setting of boring-bar tools frequently takes considerable time by the usual "set and try" method. The illustration shows a micrometer tool setting gage designed in the plant of the Pierce-Arrow Motor Car Co., Buffalo, N. Y., and which has proved very satisfactory both from the saving of time and the accuracy secured.

The gage consists primarily of a micrometer head *A* mounted in a special V-block *B*, all the dimensions being given. It is necessary to have the micrometer head on the center line of the V and also to have it square with the bearing surfaces of the block. The micrometer head is a Brown & Sharpe No. 294 graduated in English measurements. The hole for clamping the micrometer head should be machined to fit the barrel of the head very accurately. A 10-32 fillister-head screw is used in clamping the barrel, which is counterbored for the head, as shown. The V-block is made of low carbon steel and the V-surfaces are case hardened and ground to insure accuracy. It will be noted that the bearing surfaces



MICROMETER GAGE FOR SETTING BORING BAR TOOLS

are relieved to a depth of 0.030 in. in the center as shown at *C*.

This instrument is used in connection with boring bars varying from 1.124 to 2.124 in. in diameter. The accompanying table shows the readings of the micrometer when the sides of the V-block and the micrometer spindle are all bearing against the boring bar.

WHEN SIDES OF V AND END OF MICROMETER SPINDLE ARE TOUCHING BAR, READING SHOULD BE:

0.0	For 2.124 diameter bar	0.104	For 1.624 diameter bar
0.026	For 1.999 diameter bar	0.142	For 1.437 diameter bar
0.052	For 1.874 diameter bar	0.207	For 1.124 diameter bar

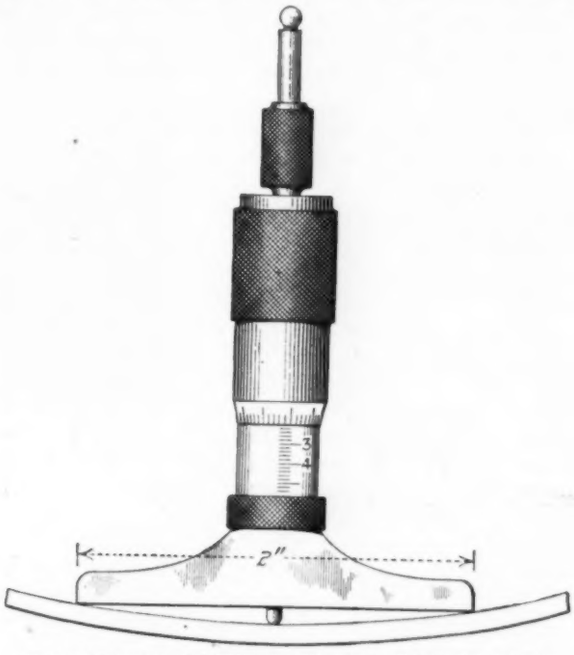
If for example, the instrument is used on a boring bar 1.624 in. in diameter, the micrometer will read 0.104 in. when the end of the spindle touches the bar. If a hole 1.850 in. in diameter is to be bored with this bar the cutter must project 0.113 in. beyond the bar or half the difference in the diameters of the bar and of the hole to be bored. To set the cutter it is simply necessary to add 0.113 to 0.104, which gives 0.217 as the proper reading for the micrometer to bore a hole 1.850 in. in diameter.

Obtaining the Radius of an Arc

BY ATOL MAKER

In making a certain die recently the writer found it necessary to determine the radii of several circles of which in each case only a small arc was available for the purpose of taking the measurements.

On page 606 of the *American Machinists'* handbook (third edition) a method is described for obtaining the diameters of circles under similar circumstances



MICROMETER DEPTH GAGE TO MEASURE RADII

by means of two scales, and this method I applied by substituting my micrometer depth gage for the scales.

I found that the gage was slightly over 2 in. across the base and that the corners were not sharp. By grinding the ends until the base measured exactly 2 in., I obtained the necessary sharp corners and also made certain that the measuring rod was exactly midway between the ends.

By making the length of the base exactly 2 in. I simplified the necessary figuring, while the micrometer measuring rod, which I fitted with a special ball point, enabled me to determine the radius within a reasonable limit of precision.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

April 26, 1923

An Example of Railroad "Economy"

A STRIKING example of the costly economy practised by some railroad managements was recently brought to light in a Western railroad center. This road has spent many millions of dollars in new locomotives of an advanced type. The maintenance of this equipment required a type of lathe different from any the shop afforded but the officials turned down the request of the shop superintendent for such a machine on the grounds of economy.

He naturally proceeded to build a machine which would answer the purpose for it was up to him to keep the new motive power in operation. This machine was not as good for the purpose as a suitable lathe would have been and by his own admission cost twice as much to build as to buy. But he had to have it no matter what the expense.

The cost of the machine went into the shop maintenance account so that the economizing officials do not know that it exists. But it is this kind of false economy which has helped put the railroads in their present embarrassing financial position.

How the Weather Affects Machinery Sales

WE HARDLY think of the machine tool business as being affected by the weather or its seasons. Yet one cannot travel in the country beyond the Rockies without being made aware that the weather does have its effect.

In the northwest, for example, there have been several dry seasons which resulted in small crops and directly affected the farmer, or rancher, in all his purchases. Agricultural machinery, automobiles, electrical equipment for the ranch and many other things had to wait until crops were better.

In Arizona and New Mexico the dry years affected the cattle raisers and left them very short of funds. All these things have more to do with machine tool buying than we may imagine.

There has been a fairly heavy snow fall in the mountains during the past winter which means water in the rivers and irrigation ditches this summer. Consequently there are probabilities of big crops in the Northwest and of more cattle in the Southwest—both of which will be reflected in the buying of machinery.

The Trail of the Motor Vehicle

SO MANY changes in our mode of life and in the use of machinery are due to the marvelous growth of motor transportation that it is impossible to estimate what would happen were the motor vehicle suddenly to disappear. When, in the early days of motoring, we planned our trips with the problem of securing fuel always in mind, we little dreamed of the day when it would be possible to get fuel for the motor more easily than food for ourselves.

The situation mentioned is particularly noticeable in traveling through the more sparsely settled sections of the country. There are many small towns along the main traveled roads where we see from one to four garages and very little besides. They all have some kind of machine or tool equipment even though it may be confined to a drill press and a lathe. And, in spite of the general criticism of garage mechanics, they can usually fix you up so you can travel. A welding outfit is also a part of almost every garage equipment, being used for heating bent parts in straightening as well as for its original purpose.

Nor is the springing up of small garages the only evidence of change. Old established concerns usually designated as "Iron Works," which formerly built all sorts of machinery and probably looked upon the motor vehicle as a toy 15 years ago, now have a department where motors are overhauled or at least one where pistons are fitted. Cylinder grinding machines have found their way into shops which never before boasted anything but a small bench grinder. The amount of money invested in machinery especially designated for motor repair would make an astounding total.

Another effect of the motor vehicle has been the increased accuracy in workmanship in the fitting of parts. Scant sixty-fourths have given place to thousandths and everyday mechanics now talk of and work to "tenths" without batting an eye. The fitting of pistons and piston pins is largely responsible.

The change which has been brought about by the automobile is perhaps more noticeable in the far West where rough and ready machines and methods answered most requirements. But the same mechanics can today hold their own with men brought up on the finer measurements.

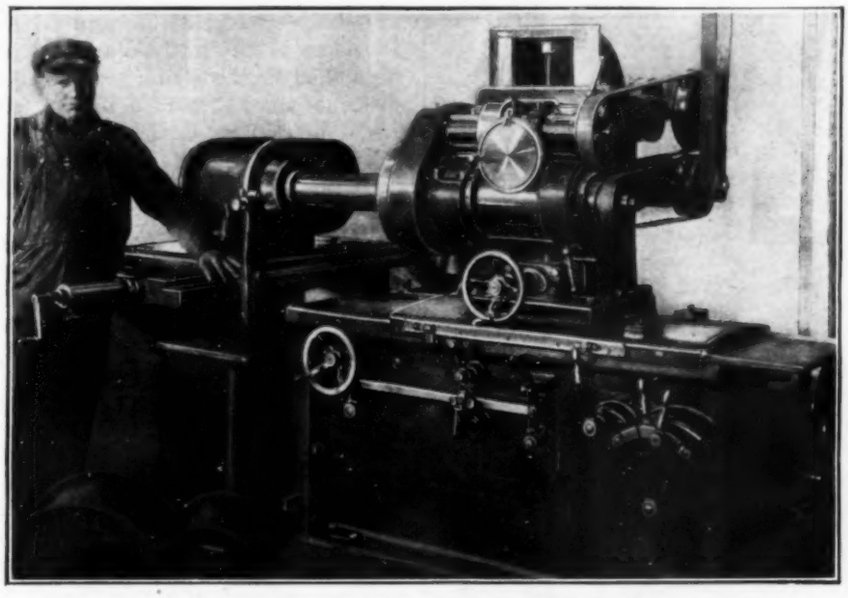
The grouch who tries to hang all the expenditure for automobiles and the machinery for repairing them to the degeneracy of the pleasure seeking public must modify his tune. In the far Western states motor buses and motor trucks play an important part in the life of the people. Huge buses run almost the whole length of the Pacific Coast on schedule. And while the main lines have specially built cars, there is quite a business in rebuilding large, high-powered passenger cars which have gone out of fashion for private use into long wheelbase buses for shorter runs.

Altogether the motor vehicle has made far greater markets for machinery than any other mechanical development.

Shop Equipment News

Churchill Internal Cylinder Grinding Machine

For the purpose of grinding cylinders, liners and holes in machine parts which, owing to their external shapes, cannot be rotated in the usual sizes of grinding machines, the Churchill Machine Tool Co., Ltd., of Broadheath, Manchester, England, has recently placed on the American market a type of internal grinding machine that is particularly adapted to locomotive and railroad work. The machine is so constructed that it can be used for generating holes in exact relationship and at correct center distances from previously finished locating surfaces or slides, which insures alignment with a minimum of correction by hand work.



CHURCHILL NO. 2 INTERNAL CYLINDER GRINDING MACHINE

The machine has a large table with cross adjustment only for positioning the work, the table remaining stationary during the actual grinding. The table is carried on a base that reaches to the floor; and while the base is coupled to the machine, it is independent of the latter so that larger or smaller tables can be fitted to suit various classes of work. If necessary, the table may be removed altogether and a base plate substituted.

The grinding wheel spindle is provided with a planetary motion, is adjustable while the grinding is going on and is carried on a head vertically adjustable on the column. The column is mounted on a slide having an automatic longitudinal movement on the bed, which movement is controlled by adjustable reversing dogs that vary the stroke to suit the length of the hole to be ground. The slide is provided with various changes of speed for use while grinding. On the Nos. 3 and 4 machines there is a quick traverse, independent of the reversing dogs, which can be automatically operated so that the grinding wheel traverses at high speed over the chambered portions of long holes.

The main spindle, on which the extension grinding wheel spindle is mounted, also has various changes of speed provided, which can be operated independently of the traverse speed. It is claimed that the grinding wheel spindle can be detached from the main spindle and changed for a larger or smaller size in a few minutes. A full range of spindles is obtained so that holes from the smallest up to the capacity of the machine can be ground.

The planetary motion of the grinding wheel spindle admits of sensitive control, the controlling handwheel being provided with a dead stop. On the Nos. 1 and 2 machines the adjustment is obtained by means of double eccentric spindles controlled through a differential motion, and in the larger sizes the adjustment is obtained direct on a slide mounted at right angles to the main spindle and operated by means of a screw and differential motion. It is claimed that a large range of adjustment to the grinding wheel is provided by this construction, so that wheels considerably smaller than the holes to be ground can be used, thus reducing the arc of contact between the wheel and the work, and allowing a very considerable range of wear on the grinding wheel.

By means of the cross adjustment of the table and the vertical adjustment to the spindle, work having a large number of holes can be ground without disturbing the setting on the table. Within the capacity of the machine there is no limitation to the external shape of work which may be handled.

The machine is entirely self-contained, and may be driven from a single overhead countershaft or directly connected to a constant-speed motor.

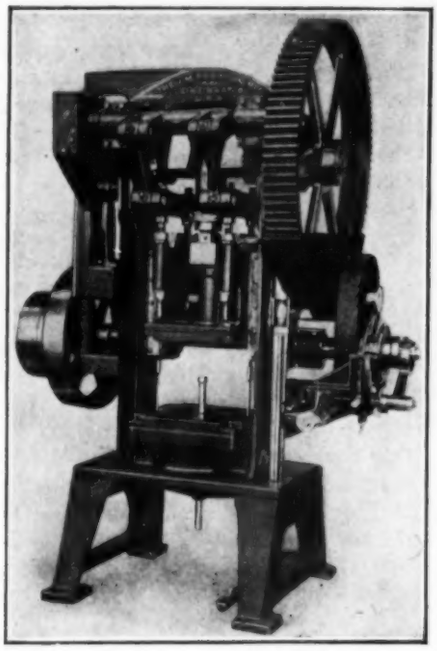
It is claimed that with the machine a cylinder 8 in. in diameter and 12 in. long can be ground to a high finish and have 0.02 in. of metal removed in 20 min., and that a bore 14 in. in diameter with the same length and amount of metal removed can be finished in 40 minutes.

Robinson Toggle Drawing Press

An improved blank holding mechanism is a feature of the toggle drawing press recently placed on the market by the J. M. Robinson Mfg. Co., Cincinnati, Ohio. The variation of the pressure of the blank holder during the dwell period is claimed to be eliminated in this press and

the pressure is maintained constant during the full working period of the press. Tearing of the metal due to variation of the pressure of the blank holder on it during the dwell is thus eliminated.

The main frame of the press is made of a one-piece cast-iron casting



ROBINSON TOGGLE DRAWING PRESS

while the main shaft, rocker arms and toggles are made from steel castings. The blank holder or outer slide as well as the head or inner slide have long bearings that provide support during the entire travel of the stroke. All bearings and link motions are bushed. A friction clutch is regularly fitted to the machine with an automatic operating mechanism which can be thrown out and thereby place the machine under the control of the operator by means of the hand lever.

The press is made in six sizes, capable of punching holes from 6 to 16 in. in diameter, weighing from 5,700 to 35,000 lbs., requiring from 3 to 10 hp. to drive them and having from 34 to 10 strokes per min. The No. 205 press, illustrated herewith, has a weight of 11,000 lbs., and covers an overall floor space of 54 x 90 in. It is capable of punching a hole 11½ in. in diameter, holds a maximum blank of 18½ in. in diameter and requires a motor of approximately 5 hp. to drive the belt wheel at 350 r.p.m. The bed has a 10 in. opening. Adjustments of 4 in. are provided for the blank holder and plunger which have strokes respectively of 6½ and 10½ inches.

Superior Machine Tool Co. 20-Inch Drilling Machine

The feature of a recently developed 20-in. vertical drilling machine is its flexibility and adaptability to both jobbing and manufacturing. The unit method of assembly is used, with all parts interchangeable, to permit the converting or reassembling of the machine to meet requirements. The machine is manufactured by the Superior Machine Tool Co., Kokomo, Ind.

Six types of the machine are available, depending upon the type of drive and feed. A grooved table for coolant and a pump can be furnished. The B1 machine illustrated herewith, is equipped with cone drive, back-gears, geared feed and both wheel

"SUPERIOR" 20-INCH VERTICAL DRILLING MACHINE

and pilot hand feeds. Its base is ribbed and provided with T-slots for securing work. The table is 17 in. in diameter and has a supporting shoulder on the hub.

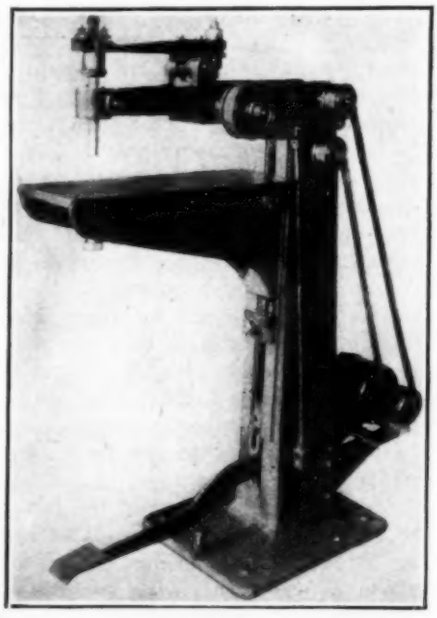
The spindle is of 50-point carbon steel with a No. 3 Morse taper hole and a standard ball thrust bearing. The drift slot for the taper hole is located in the shoulder of the spindle, being exposed at all times. With the back-gears in use, the spindle speeds vary from 25 to 226 r.p.m.; and without, from 97 to 875 r.p.m. Six spindle feeds are possible, ranging from 0.005 to 0.018 in. Three of these feeds are obtained by shifting the key and three by sliding the gear on the top shaft.

A cast-iron spindle sleeve with bronze bushings and graduations on the full length of travel is used. The stop collar is arranged to allow for the maximum travel without removal. The rack is of steel and is secured between shoulders. A worm and gear which are permanently in mesh and run in a bath of oil, operate the rack pinion and shaft.

The machine occupies a floor space of 16 x 47 in., and 16 x 54 in. with a motor drive. The maximum height of the machine with the spindle extended is 79 in. The maximum distances from the base to the spindle and table to spindle are, respectively, 41½ in. and 26 in., while the traverses of the spindle sleeve and the table are, respectively, 8½ in. and 23½ in. Work up to 20½ in. in diameter may be drilled in the center. A 9 x 3 in. driving pulley intended to run at a speed of 450 r.p.m. is attached. A geared motor drive is applicable to all types of the machine, with motor speeds varying from 750 to 1,800 r.p.m. The net weight of the B1 machine is 790 pounds.

Grant No. 4 Rotary Vibrating Riveting Machine

The Grant Manufacturing & Machine Co., Bridgeport, Conn., has recently developed a rotary vibrating riveting machine, designated as the No. 4 and capable of handling a wide variety of work because of the depth



GRANT NO. 4 ROTARY VIBRATING RIVETING MACHINE

of throat and other features provided.

The machine illustrated herewith is a motor-driven type used for riveting flat pieces. Belt drive from a countershaft can also be arranged; and when a cylindrical drum is to be riveted, a horn that is suitable for this type of work is fitted to the machine. Control is by means of a treadle.

The throat depth of the machine is 18½ in., which permits of heading rivets in the center of a 36 in. circle. Rivets up to ⅞ in. in diameter can be headed.

Coats Universal Angle Plate

A universal angle plate for use on milling and drilling machines, and which is especially adaptable for holding and indexing circular work such as disks, cones or cylinders, in order to present successive portions to the action of the cutting tool, has recently been placed on the market by the Coats Machine Tool Co., 108 West 40th St., New York, N. Y.

The device, as shown in Fig. 1, comprises a rotatable cast-iron faceplate 6 in. in diameter, with T-slots into which clamps may be inserted to hold the work. A ¾-in. central hole is also provided for holding work and fixtures. Plugs are furnished for this hole for use when centering work. The edge of the faceplate is graduated in degrees, and the plate may be locked in any position of rotation.

Steel indexing plates which engage a hardened steel pawl can be used for indexing the faceplate; they are mounted on the bottom of the faceplate, as can be seen in Fig. 2. These indexing plates are interchangeable and are supplied in six sizes having from 12 to 360 divisions. The complete unit can be fastened to the machine table by means of clamps and bolts, which are here shown mounted on the angle plate itself.

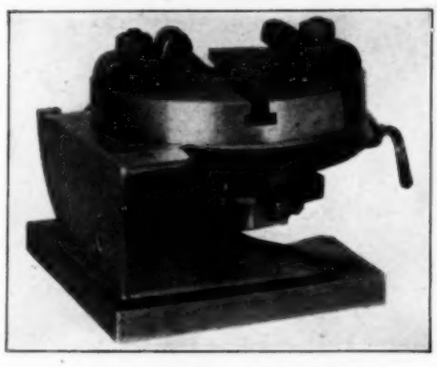


FIG. 1—COATS UNIVERSAL ANGLE PLATE

FIG. 2—PLATE SET AT AN ANGLE

A graduated swivel that can be locked in any position enables the axis of the faceplate to be set at an angle about a horizontal axis. The base and bracket of the angle plate are made of cast iron.

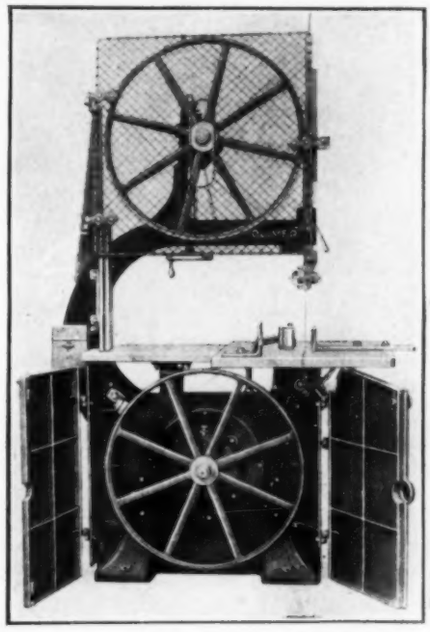
Oliver No. 16 Direct-Drive Band Sawing Machine

An addition has recently been made to the line of band sawing machines built by the Oliver Machinery Co., Grand Rapids, Mich. The machine herewith illustrated is designated as the "Oliver" No. 16 direct-drive band sawing machine.

The feature of this machine, as is implied by the name, is the drive by means of a motor mounted directly on the shaft of the lower wheel. The rotor is keyed to the shaft, which runs in two ball bearings supported by the two end bells. These end bells have concentric tongues which fit inside the rings of the frame of the machine as well as the stator, an arrangement which provides for alignment and accessibility. The motor is fully enclosed but has an air gap running up into the column, which is claimed to provide sufficient circulation of the air within the enclosure to keep the motor cool. This type of drive is particularly recommended when a 600 r.p.m., 2- or 3-phase, a.c. motor can be used.

The frame is a one-piece casting with a base 40 x 22 in. in area and 6 ft. 7½ in. in height. The cast-iron table is 36 x 30 in. in size and 40 in. from the floor. It is mounted on rockers and seats having a tongue and groove fitting and provided with a take-up for wear. A double rib around the edge provides a hold for form clamps; and by means of a handwheel the table may be tilted 45 deg. to the right and 5 deg. to the left, through a self-locking worm and wormgear device, the amount of tilt being registered by an index and pointer. Work up to 36 in. in length can be inserted between the blade and column, while a 16 in. clearance is under the guide. An auxiliary table 19 x 23 in. is also furnished.

A U-shaped wooden guard is provided at the rear and an L-shaped steel guard with wood facing at the front. The 17 ft. 5 in. blade is covered at all parts except between the guide and the table, where the sawing is done. The lower wheel is encased as shown by two iron doors, while the upper wheel has a heavy wire-mesh guard which is supported on a cast-iron hinged bracket attached to the column of the machine and locked with a spring clasp.



OLIVER NO. 16 DIRECT-DRIVE BAND SAWING MACHINE

Both wheels are 36 in. in diameter and 2 in. wide, with rubber facing, and secured to the wheel shafts on taper bearing surfaces. The upper wheel has a vertical adjustment of 12 in. for tensioning the saw, and may be tilted for tracking the blade on the wheel, by means of a micrometer screw attachment. All adjustments are controlled by handwheels.

The guides are of the roller type, one above and the other below the table. Steel side guides or lips prevent the saw from turning sidewise. Other attachments which may be furnished are a spring pressure roller and adjustable fence, miter cut-off gage with slides in the table and a plain ripping fence. The floor space occupied is 48 x 60 inches.

Lees-Bradner Gear-Tooth Testing Machine

In making high grade gears on a large scale some rapid and accurate method is required to determine the accuracy of the product. The Lees-Bradner Co., Cleveland, Ohio, has recently developed a machine for this purpose which measures the accuracy of that portion of the tooth contour that conforms to an involute curve, and also measures the spacing of the teeth of the gear. Fig. 1 gives a general view of the machine, which is capable of indicating errors as small as 0.0001 inch.

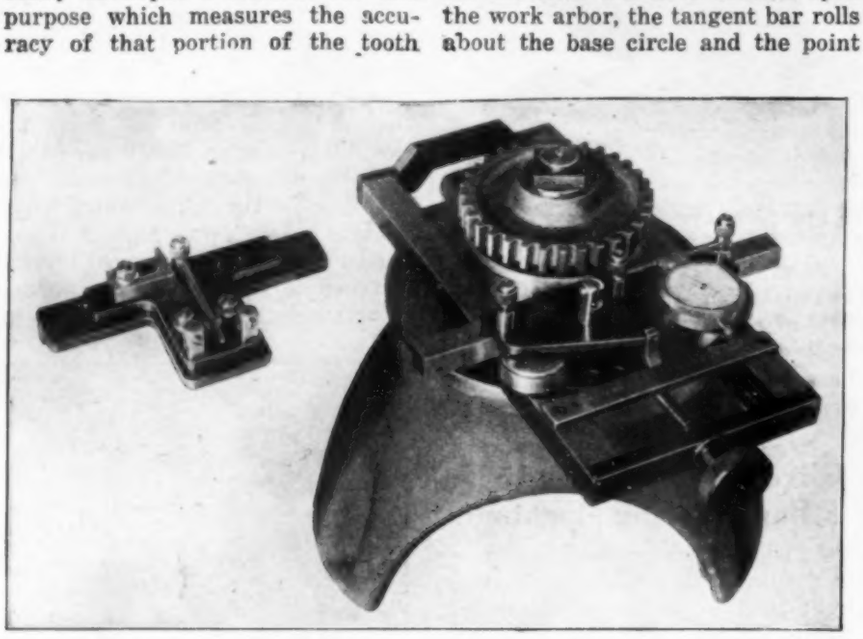


FIG. 1—LEES-BRADNER GEAR-TOOTH TESTING MACHINE

A top view of this machine is shown in Fig. 2. The disk shown on the work arbor is of the same diameter as the base circle of the gear to be inspected. A tangent bar or straightedge is held against the base circle under spring tension by the two ball bearings on the slide frame. As the slide frame is rotated upon the work arbor, the tangent bar rolls about the base circle and the point of the contact lever traces the involute of this base circle.

Fig. 3 shows the gear to be tested in place on the disk. The straightedge carries a bracket on which are mounted the contact point, magnifying levers and a dial indicator. The contact point engages successive teeth of the gear, and if the tooth curve is a perfect involute the hand of the indicator attached to the device will stand at zero while the contact point travels from the base circle to the point or outside edge of the tooth. The graduations showing on a cross member of the slide frame, just below and to the left of the indicator, comprise a travel scale which shows the progression of the point of tangency upon the tangent bar, and, therefore, the progression of the contact point up toward the point of the tooth. The graduations are arbitrary and need have no numerical unit assigned to them. Thus, if on a given tooth 21 graduations represent the travel from the base circle to the point of the tooth, a tabulated record can be made showing the deviations of the indicator, plus or minus, at each of these lines. In this way a curve may be plotted to show where the tooth is high or low, or in other words, where the tooth varies from the true involute. If the gear has a greater or lesser pressure angle than the one intended, this fact will show at once in a definite way on the indicator. The indicator reads to 0.0001 inch.

The machine may also be set up to test the tooth spacing, as shown in Fig. 4. The indexing fixture shown at the side in Fig. 1 is placed on the machine and locked in position against the disk serving as the base circle. This fixture does not move upon the base circle, but it is secured on the slide frame. It has two contact points, which engage the sides of two adjacent teeth at points equidistant from the base circle. The con-

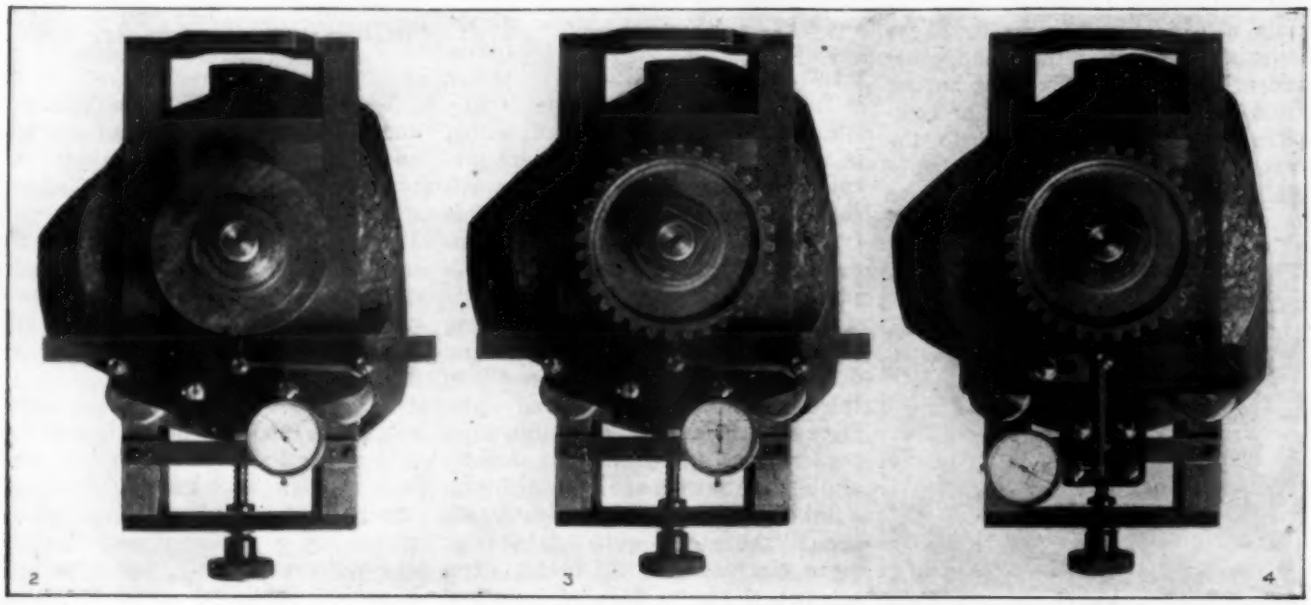


FIG. 2—LEES-BRADNER GEAR TESTING MACHINE WITH WORK REMOVED. FIG. 3—TESTING THE INVOLUTE FORM OF GEAR TEETH. FIG. 4—MEASURING THE TOOTH SPACING OF GEAR TEETH

tact point at the left is fixed, being clamped in position on the fixture; the other point is pivoted on a magnifying lever through which the motion is transmitted to the dial indicator.

The indicator is set at zero when the first tooth space is measured, and then the gear is lifted out of engagement with the stop and rotated one tooth. As each successive tooth is brought up, the indicator reading is noted. If the tooth spacing is correct, the indicator needle remains at zero; but if the tooth spacing is not uniform, the indicator shows the magnitude of error to 0.0001 in., plus or minus, from the setting on the first tooth space. As gear noises are usually caused by uneven spacing of the teeth, the indicator shows the condition of the gears in this respect, in addition to showing whether an error exceeds the tolerance.

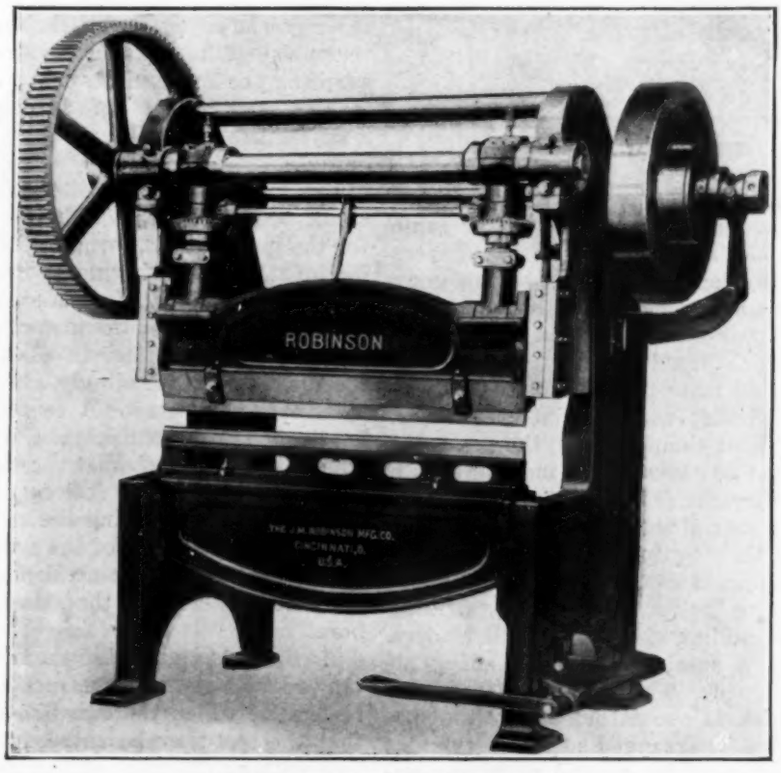
Robinson Gap Forming Press

A gap forming press or brake that is suitable for plants manufacturing metal furniture or mouldings has recently been placed on the market by the J. M. Robinson Manufacturing Co., Cincinnati, Ohio. This press, illustrated herewith, utilizes the same dies as the larger Robinson press-type brake for shorter work, and it can be converted into a gang punch.

The cast-iron main frames of the machine are made with a deep gap which is a convenient feature when wide sheets are to be formed which are longer than the distance between the housings or when metal is formed over the dies and must be removed by sliding from the end. The cranks of the steel crankshaft are fitted close against the main bearings.

A friction clutch controls the press. By stepping on the treadle the brake is released and the clutch engaged, and when the foot is removed the clutch is disengaged and the brake again applied. Both pitmans are adjusted simultaneously by means of a reversible ratchet device, an arrangement which is said to prevent the plunger from getting out of line when adjustments are made. The plunger is mounted in gibs that can be adjusted to take up side and end play.

The press is made in three sizes. An overall height of 8 ft. 1 in., a gap depth of 12½ in., and a gear ratio of 8 to 1 are provided for all three. The distances between the housings are 4 ft. 6 in., 5 ft. 6 in. and 6 ft. 6 in., while the weights are 6,600, 7,300 and 8,000 lb., respectively. The slide has a stroke of 3 in. and an adjustment of 2 in. for all types. The distance from the bed to the slide with the stroke down and the adjustment up is 9 in. The 30-in. flywheel is run at 275 r.p.m.

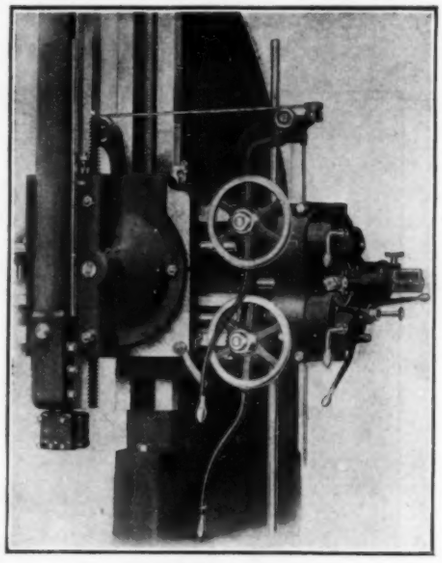


ROBINSON GAP FORMING PRESS

Bullard "Maxi-Mill" with Hand Feed Levers

In line with the developments by manufacturers to increase the production of machine tools the Bullard Machine Tool Co., Bridgeport, Conn., has equipped its "Maxi-Mill" boring mill, described on page 973, Vol. 48 of the *American Machinist*, with an added feature in the form of special hand feed levers. These levers are mounted at both ends of the rail.

With these hand feed levers the operator can feed the tools by hand when starting cuts or when making heavy cuts, and at the same time he can stand in position to closely observe the cut. The long leverage of the hand feeds also facilitates the holding of the tool to the work when tough scale and chilled cast iron or hard steel are being cut. When the method of form templet and pointer attached to the tool slide is used, the length of the levers permits the operator to watch the work closely and guide the cutter with greater ease and accuracy than was possible with the older method.



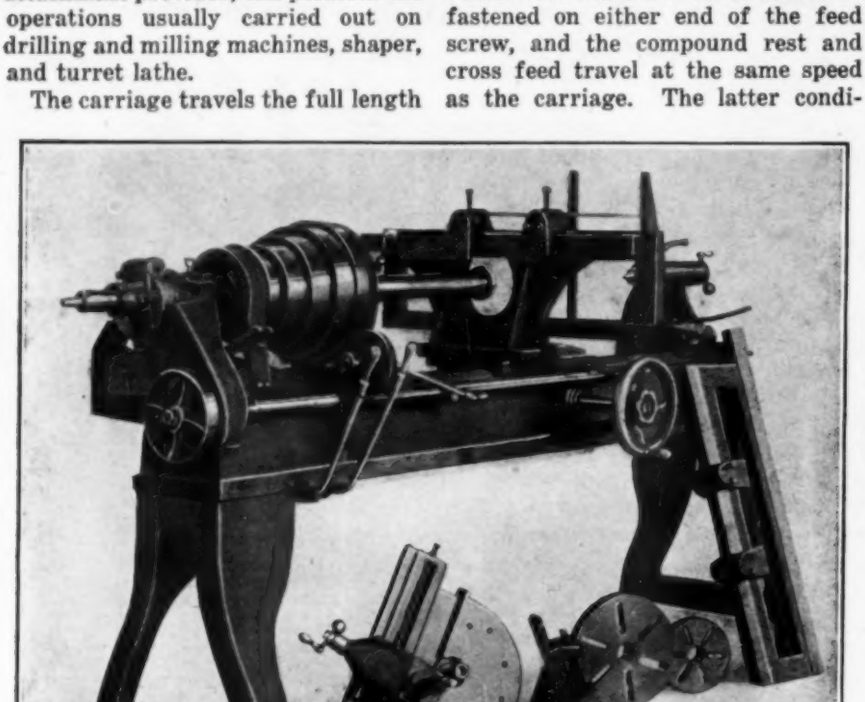
BULLARD "MAXI-MILL" WITH HAND FEED LEVERS

In construction, as shown in the accompanying illustration, the hand feed lever is pivoted on a swinging collar that is mounted on the hammer handwheel supporting bracket. The teeth on the hand lever engage the teeth of the hardened-steel clutch on the hub of the handwheel when the lever is moved forward slightly, thus feeding the tool to the work. When not actually held in engagement the lever automatically drops out of engagement, a feature which insures safety in operation.

Landis Multi-Purpose Lathe and Cylinder Grinding Machine

The lathe shown in the accompanying illustration has been recently placed on the market by the S. K. Landis Co., Lancaster, Pa. It is especially intended for small jobbing and automobile repair shops. The machine not only does the work of an engine lathe, but with the special attachment provided, can perform the operations usually carried out on drilling and milling machines, shaper, and turret lathe.

The carriage travels the full length of the 7 ft. 3 in. bed, and is 9 in. wide and 15 in. long. It has a center hole for the pivot bolt which holds the compound rest and turret to the carriage. The compound rest has a circular swivel 6 in. in diameter of the two-bolt type. Full length gibs are provided on both the cross and compound rest slides.



LANDIS MULTI-PURPOSE LATHE AND CYLINDER GRINDING MACHINE

The turret attachment is of the semi-circular type, 15 in. in diameter, with graduations on the circular side so that it can be set at any angle desired. The straight side of the turret has raised guide ways 20 in. long on which the compound rest may be mounted. When so mounted the compound rest may be turned to any angle on the lathe, and at the same time be attached to the universal power feed and moved by it in either direction.

The power feed is applied to the carriage between the ways or tracks by a worm gear, rack and pinion, directly in line with the center of the headstock and tailstosk, an arrangement which is claimed to give a powerful and balanced feeding thrust. The shaft driving the universal feed for the cross slide can be fastened on either end of the feed screw, and the compound rest and cross feed travel at the same speed as the carriage. The latter condition makes it possible to cut a taper or a thread on a disk in the same manner as with a lead screw. Tapers of any degree can be cut by fastening the universal shaft at either end of the cross screw or slide.

For thread cutting, eight gears having from 32 to 60 teeth are provided that will cut sixteen threads. Without compounding, the gears cut 16 to 30 threads per inch, and with it they cut from 8 to 16. Gears for any special thread may be furnished.

Other equipment and special attachments consist of a centering or boring holder, follow rest, drilling pad, milling vise, tool and die holders, and a special cylinder-grinding attachment. The grinding attachment, which is shown set up on the machine, is arranged so that a cylinder block may be ground with one setting. Cylinders up to 10 in. in diameter and 40 in. long can be ground without resetting, by using special equipment. A feature of this attachment is the automatic adjustment of the grinding wheel shaft to and from concentric relation with respect to the spindle, to regulate the planetary movement of the grinding wheel. An 8-in., four-jaw chuck is recommended, as this size chuck will allow the carriage to run under it to the head of the machine, and with the cross slide turned longitudinally, the tailstock can be brought against the carriage. Also by using a chuck of this size the centers may be brought up to the chuck for small work, and the universal joint feed and cross feed screw may be used for feeding purposes.

The lathe occupies a floor space of 28 in. x 8 ft., has a distance between centers of 52 in. and weighs 1,655 lb. Its swing over the ways is 18 in., while the swing over the carriage is 10½ in. A speed of from 175 to 200 r.p.m. is recommended for the line-shaft, with a 1-hp. motor. The spindle has a hole and nose, respectively, 1⅛ and 2¼ in. in diameter. The large hole makes it possible to put axles, bar stock and other automobile parts through it for threading and similar operations on the ends.

Federal Cylinder Test Gages

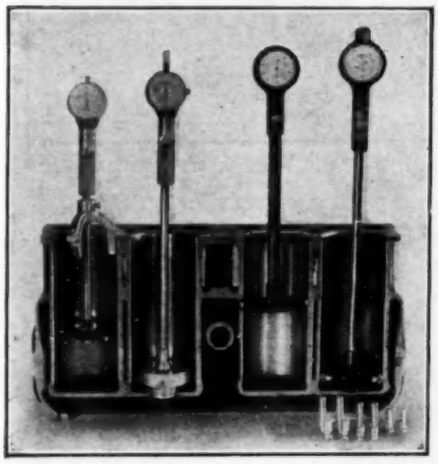
The Federal Products Corporation, 15 Elbow St., Providence, R. I., has recently placed on the market a development of its cylinder test gages, adapting the instruments more fully to the requirements of automobile manufacturers, service stations, and garages.

The gage shown at the left in the accompanying illustration is intended for the manufacturer who is producing quantities of engines with but one diameter of cylinder bore and, as its range is limited to a maximum difference of but ¼ in. in diameter, the dial is correspondingly sensitive to minute variations. A centralizer is attached to the central tube, within which is the rod that transmits the movement of the feelers to the pointer; and by entering the centralizer into the open end of the cylinder, the tool is held in a central position and also parallel with the axis of the bore.

A conveniently located thumb button provides means of retracting the feelers, of which there are three, so that the tool may be entered in the bore without difficulty. Upon release,

the feelers are allowed to contact with the cylinder walls and thus indicate the diameter of the bore upon the dial. The centralizer is held to the tube by a knurled-head thumbscrew which, when released, allows the tool to be moved up and down throughout the length of the cylinder without disturbing its central position; and thus the pointer will register any irregularity that may exist either in respect to diameter, roundness, or parallelism of walls.

An aluminum hood encloses the dial gage without touching it and



FEDERAL GAGES FOR CALIBRATING CYLINDER BORES

thus protects it against accidental injury. A feature of the dial is the graduation, which allows a variation of 0.020 in. plus or minus to be read to half-thousandths of an inch without difficulty. This graduation is shown in the illustration only on the gage to the right, but either the 20 - 20 or the 50 - 50 graduation may be furnished for any gage.

The second gage from the left is also of the three-feeler type, but is designed to cover a range of $\frac{1}{4}$ in. in diameter, and is therefore adapted to the use of manufacturers who make more than one diameter of cylinder.

The second gage from the right in the illustration is similar to the first instrument described, but is equipped with two diametrically opposed feelers. Though intended primarily for the gaging of cylinders, its straight line measurement adapts it as well to other than round work.

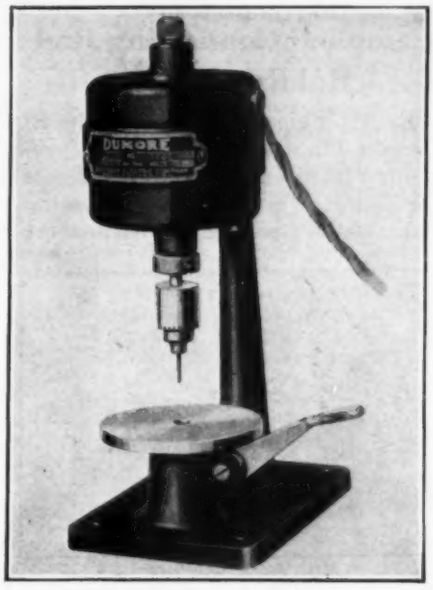
At the right in the illustration is a two-feeler gage designed to measure all diameters, or distances between opposed surfaces, from $2\frac{1}{8}$ to 6 in. This result is accomplished by using several sets of interchangeable feelers, or extensions, held in position by knurled nuts. The lengths of the various pairs of feeler extensions are so calculated as to overlap in either direction within the capacity of the dial, and thus any measurement between the extreme limits can be quickly obtained.

The movement of the feelers is transmitted to the central rod through hardened and ground steel cones, so that turning the tool while in the cylinder does not interfere with the accuracy of the registration. The dial gages are of the standard Federal rack and pinion type.

"Dumore" Type A Electric Bench Drilling Machine

The latest product of the Wisconsin Electric Co., Racine, Wis., is the motor-driven electric bench drilling machine shown in the accompanyig illustration. It is adapted for fast drilling on work that requires a high speed and sensitive drill. Raising the table by means of the lever feeds the work to the drill.

The machine is equipped with a Dumore universal motor which is dynamically balanced and can be run



"DUMORE" TYPE A ELECTRIC BENCH DRILLING MACHINE

with either a.c. or d.c. current. A foot controlled rheostat provides a means for regulating the spindle speed to meet the requirements of each individual job.

A No. 0 balanced and ground Jacobs chuck is used. It is claimed that because the chuck is balanced it helps to eliminate vibration, and thereby makes it possible to use the drill on small parts. The machine is capable of drilling a $\frac{1}{4}$ in. hole in steel. In brass and soft metals, where the high speed is of particular value, a larger hole can be drilled.

Federal Micrometer Dial Gage

A tool for gaging variations in diameter of small work is shown in the accompanying illustration. It is made by the Federal Products Corp., 15 Elbow St., Providence, R. I.

The tool consists of a convenient

FEDERAL MICROMETER DIAL GAGE

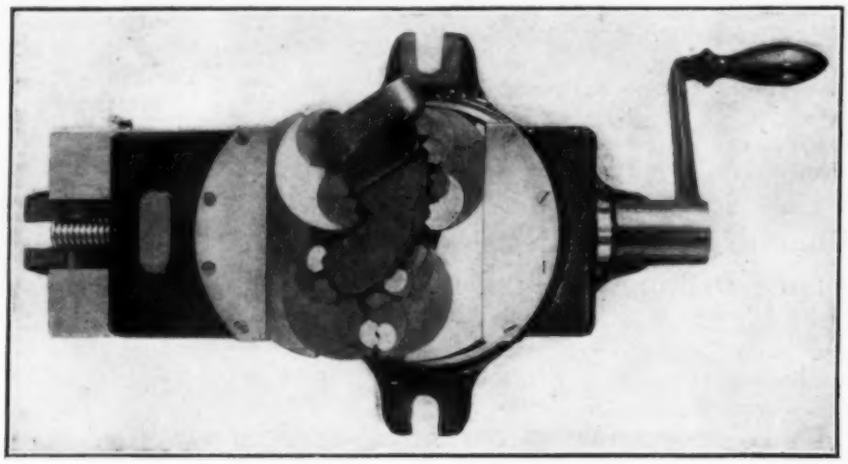
bench stand for holding a dial indicator at any desired angle, and a pair of micrometer jaws between which the work is inserted. It has a capacity from zero to $\frac{3}{4}$ in. A collar with a knurled-head setscrew upon the upper end of the measuring spindle holds the jaws open at a point just under the required diameter of the work to be gaged, so that they do not have to be opened by the operator to get the work in.

An adjustable gage-pin at the bottom of the yoke may be set to allow the work to enter to its full diameter between the jaws, which thus facilitates the rapid handling of many pieces. The ends of the jaws are beveled. An anvil with a convex surface can be furnished for use when gaging the thickness of wall of piston rings and similar work.

The dial is graduated to read to 0.020 in. plus or minus in increments of one-half thousandths of an inch. The zero line is brought into coincidence with the pointer by turning the bezel, which is provided with a clamp to prevent the accidental disturbing of the setting.

Mantle Vise With Multiple Adjustable Jaws

Montrose Newman, Inc., 342 Madison Ave., N. Y., has just placed on the market a vise intended for holding securely but without damage parts having irregular form, angles or curves. The vise, the construction of which can be seen in the accompanying illustration, is manufactured by Mantle & Co., New York, N. Y.



MANTLE VISE HAVING MULTIPLE ADJUSTABLE JAWS

The body of the vise is made of cast iron. The spindle and all of the jaw parts except the smallest are made from chrome-nickel steel. The smallest jaws, which are the ones touching the work, are made from oil-hardened tool steel, and all the jaws are hardened to prevent chips from embedding in the surfaces. The jaws are 4¾ in. wide and provide a maximum opening of 4½ inches.

Both the movable and the sliding jaws of the vise carry sets of multiple jaw members that can automatically adjust themselves to the shape of the work. The adjustable members are semi-circular in shape; there are four sizes and each member except those touching the work is fitted to receive two smaller ones. The jaws are dovetailed into each other, so that they can be swung until the proper contact with the work is obtained to hold any shaped object, whether circular, triangular or square.

The illustration shows the vise holding an irregular piece of work and fitted with a graduated swivel base which can be secured on a planer, or milling or drilling machine. This swivel has a diameter of 5½ in. The vise can be furnished without it, for use as a plain bench or machine fixture.

The Mantle vise has an overall length of 13 in., a height above the table of 4¾ in. and a screw ⅞ in. in diameter. The handle leverage is 5¼ inches. The vise can be employed for both toolroom and production work to eliminate the need for special vise jaws and fixtures to suit each part, particularly for first-operation work. The fact that the jaws automatically adjust themselves to the shape of the work enables speedy operation.

Campbell Connecting Rod Holding Device

E. P. Campbell, 238 North El Dorado St., Stockton, Cal., has recently placed on the market a device for holding automotive connecting rods while reaming or boring the bearings to size. The device can be applied to most makes of bearing finishing machines, and is shown in Fig. 1 mounted on a Sawyer-Weber connecting rod machine.

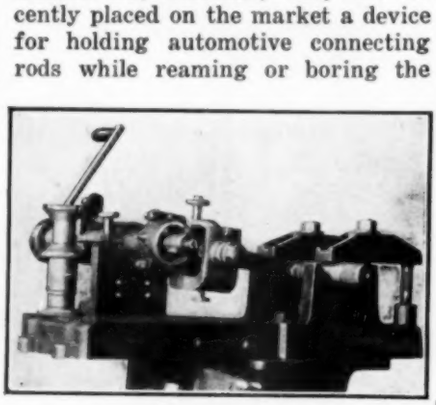


FIG. 1—CAMPBELL CONNECTING ROD HOLDING DEVICE

The purpose of the device is to enable rapid setting up and location of the rod, but without deforming or twisting it. When setting up to bore the large bearing, as in the illustration, the small bearing is centered and held on the bar at the right. The cones standing on the left of the table are mounted on an extension of the boring bar and put in the large bearing to properly position it. These locating bars and cones can best be seen in Fig. 2. The rod is then clamped into position by tightening the screws of the holding fixture, best seen at the bottom of Fig. 2. The centering cone is now removed from the large bearing of the rod, which is thus left concentric with the boring bar. The bearing can then be bored to size.

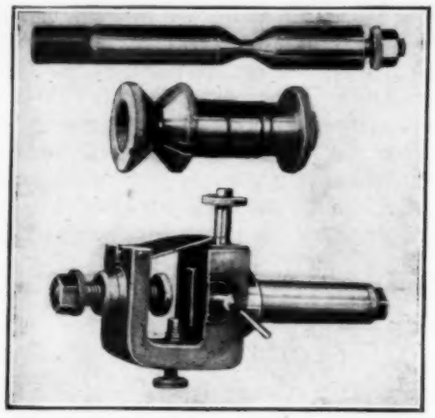


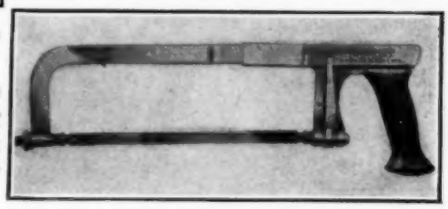
FIG. 2—PARTS OF CAMPBELL DEVICE

When rebabbitting bearings, the rod is first set up by means of the centering cone, then removed and babbitted. When replaced in the fixture it is held in its proper position and can be accurately rebored.

Morgan Hacksaw Frame

A recent addition to the line of products of the Albany Hardware Specialty Manufacturing Co., Albany, Wis., is the Morgan hacksaw frame illustrated herewith.

The frame of this device is said to be capable of standing severe strains without springing. Other features claimed for the frame are a means for the rapid releasing and tightening of the saw blades, quick adjustment to suit varying lengths of blades, and a handy method of setting the blade to cut in any of four ways. The handle has also been improved to provide an easy and natural grip for the operator, so as not to cause undue fatigue.



MORGAN HACKSAW FRAME

News Section

Interesting Employment Figures Issued

Very little change took place in employment in the manufacturing industries of New York State from December to January, states the *Industrial Bulletin* issued by the New York State Industrial Commission, Albany, N. Y. In January a slight set-back practically always occurs, but this year employment remained almost stationary. On the basis of the changes in the representative factories, it is estimated that over 13,000 employees were added to the factory payrolls for the State as a whole, and at the same time approximately the same number was released in other establishments. Employment is 18 per cent higher than in January, 1922.

The metal products group continues to add to the number of its employees. Small decreases were made in structural iron, and in the shipbuilding and repair yards. New construction work in the ship yards has been almost negligible for a long time, and repair work is necessarily irregular. In the iron and steel mills the gains were partly offset by reductions in several plants. Employment rose in all the other metal working industries. Over 6,000 employees were added, mostly in the manufacture of machinery and electrical apparatus. The makers of printing machinery continue active and practically all the factories making agricultural machinery added more workers. Some of the railway repair shops laid off a large number of employees, but the continued remarkable gain in the railway equipment factories offset these losses. One of the largest gains in any industry in January was that of the firearms.

Forty French Furnaces Shut Down

Owing to extremely low supplies of coke, French blast furnace operators have been forced to import considerable quantities from various foreign countries during the past month, Commercial Attaché C. L. Jones cables the Department of Commerce. Since the beginning of the Ruhr occupation, forty blast furnaces have shut down. Supplies from the Ruhr are increasing, and the Societe Co-operative des Hauts Fourneaux, which has charge of coke distribution, states that the worst of the crisis has passed. The Minister of Public Works estimates present daily coal receipts from the Ruhr at 4,000 tons, and expects this to be increased to 7,000 tons before the end of the month. The Minister further states that available stocks above ground in the Ruhr total 560,000 metric tons of coke and 2,000,000 tons of coal; the problem, therefore, is largely a matter of transportation. No settlement of the Saar coal strike has been reached, but Lorraine strikers are returning rapidly. Iron and steel market conditions have been generally upset, and blast furnaces are unable to fill orders. *La Journee Industrielle* estimates that the Ruhr occupation caused a loss of 100,000,000 francs to the French iron and steel industry during January and February, and a similar loss may be produced during March.

Trade Associations Are Approved

Approval of the existence of properly functioning trade associations for each important branch of industry and commerce in the country was voted by business organizations affiliated with the Chamber of Commerce of the United States in a preliminary referendum canvas April 13 last, results of which were announced recently by the National Chamber. Eight separate propositions relative to the activities of trade associations were submitted.

Discuss Electric Steel Casting Problems

The Electric Steel Founders' Research Group held a convention at East Aurora, N. Y. on April 13 and 14, and the gathering was one of the most successful in the history of the Group that has been in existence since 1920. Twenty-six representatives and executives from the five electric steel casting plants forming the Research Group, joined in a discussion of important steel foundry problems. W. H. Worrilow, president of Lebanon Steel Foundry, Lebanon, Pa. presided over the convention sessions.

The first day's progress included the reading and discussion of a paper on "Electric Steel Castings for Specialties" by W. J. Nugent, vice-president of Electric Steel Co., Chicago, Ill.

Machinery Exports Show Increase

Exports of metal-working machinery during February, 1923, with revised comparative figures for February, 1922, as compiled from the returns to the Department of Commerce, were as follows:

	February, 1922		February, 1923	
	Number	Value	Number	Value
Lathes	33	$35,247	50	$29,041
Boring and drilling machines	127	36,212	174	18,409
Planers, sharpers and slotters	10	12,073	4	6,558
Bending and power presses	12	103,135	14	23,705
Gear cutters	22	2,503	11	11,276
Milling machines	21	23,761	22	28,302
Thread cutting and screw machines	40	7,958	75	36,328
Punching and shearing machines	21	38,579	10	7,062
Power hammers	27	8,680	18	6,504
Rolling machines	1	189	6	3,120
Sharpening and grinding machines	786	65,211	2,737	70,085
Chucks, centering, lathe drill and other	1,149	12,968	2,191	18,778
Pneumatic portable tools	278	21,242	1,763	32,897
	Lb.		Lb.	
Reamers, cutters, drills and other parts for machine tools	100,735	82,556	175,961	143,104
Foundry and moling machinery	127,883	14,230	109,622	18,581
Other metal-working machinery and parts of	795,871	249,281	1,864,607	418,129
Total metal-working machinery	.....	713,827	.....	871,879

Steel Castings Set New High Record

A new high record was made in the booking of orders for commercial steel castings in March, according to reports received by the Department of Commerce through the Bureau of the Census, in co-operation with the Steel Founders' Society, from companies comprising over two-thirds of the commercial-castings capacity of the United States. The March total was 30 per cent greater than the previous high record in March, 1920, with both railway specialties and miscellaneous orders making new high marks.

Total bookings reported in March were 143,564 tons by firms with a capacity normally devoted to commercial castings of 96,900 tons, or at the rate of 148.2 per cent of capacity, as against February bookings at 93 per cent of capacity. Bookings of railway specialties amounted to 76,409 tons, or almost 200 per cent of capacity, as against 104 per cent for February bookings. Bookings of miscellaneous castings amounted to 67,155 tons, or 114.6 per cent of capacity, as against 85.8 per cent for February bookings, and, for the first time, miscellaneous bookings exceeded capacity devoted to that class of castings.

Decrease in Buying Says Dun's Report

Abatement of new buying has become sharply defined in certain basic industries, as in iron and steel and textiles, and some markets that had advanced appreciably have developed reactionary tendencies, says Dun's review of business for last week. These are not considered disquieting phases, however, the report adds, because progress had been unusually rapid during the first quarter of the year, and it was recognized by close observers that the movement could not continue indefinitely at a record breaking pace.

The slackening of domestic business expansion and the check to rising prices is not surprising, according to the review. With all previous maximums of production and distribution surpassed in different instances, it says, a temporary pause was to be expected.

Interesting Sessions at Metal Trades Convention Arouse Enthusiasm

THE TWENTY-FIFTH annual meeting of the National Metal Trades Association was held at Hotel Astor, New York, on April 18 and 19 and was very well attended. President W. W. Coleman's address discussed the extent and scope of the metal working industries and general business conditions as it affects them. He pointed out the possibilities of the blocs in Congress affecting the action of the next session and urged attention to future legislation. The revival of business with its increased demand for labor and its effect on the immigration problem was also discussed. The work of the association along educational lines, the increase in membership, the fact that only three shops of the membership had been effected by strikes, and the adoption of the budget system were mentioned among other activities of the association.

Unemployment, the great bugbear of the worker, and also of the humane employer could, he believed, be materially lessened by careful planning when there was co-operation between the men and the management. The advantages of incentive for the individual together with means for either individual or collective bargaining were emphasized, together with the speaker's belief that contact between men and management may better come through the foremen than through committees or works councils. Profit sharing, employee ownership of stock, hours of work and other problems were also discussed.

Commissioner Homer D. Sayre outlined the growth of the association from its beginning, with 51 members to the present quota of over 1,000, and pointed out that this had been due to the high class of leadership of its officers. He restated the position of the association as aiming to prevent rather than to combat strikes and spoke of the marked improvement in business, warning against the dangers of another business inflation. One notable feature was the data gathered from a recent questionnaire which showed a marked improvement in individual production and the belief that this had been a real factor in putting business on its feet once more.

Secretary Fischer's Report

The secretary, L. W. Fischer, reported that there are now twenty-five branch offices and that the operatives represented by the member companies increased in number by 86,000 during the year, due partly to the increase in membership. He said that the safety engineering department had made 2,600 recommendations to members and that this work did not duplicate that of the state and insurance inspectors because its men were not confined to the limitations of any code. The wage report as of the end of the fiscal year is now in the hands of the branch secretaries. The secretary mentioned the political issues which would arise when the new Congress convenes and urged the members to pay close attention to them and attend hearings when possible. The labor interests are always well represented, he pointed out and industry should have an equal representation.

H. C. Smith of the Illinois Tool Works, in his report as chairman of the committee on industrial education, remarked that some employers were quite as much in need of education as their men. Resistance to the recommendations of the committee for the introduction of training has greatly diminished lately, probably because of the revival of business. It is the duty of every shop to train new workers in proportion to the total number employed. To aid this work the committee has prepared a small book on elementary machine shop practice.

Immigration and Industry

The first speaker, Magnus W. Alexander of the National Industrial Conference Board, was then introduced. He spoke on the immigration question, contrasting the economic or industrial with the social point of view. The address was illustrated by a number of the valuable color charts prepared by the Board. Latest figures show that half of the ten million workers in the manufacturing industries work forty-eight hours per week or less. The reduction in work time has not been accompanied by a corresponding increase in hourly production and consequently total production has fallen off. The speaker stated that there were three ways of making up the loss, by increased individual efficiency, by better management and by a greater use of machinery. Figures show that the present labor shortage is due more to poor distribution than to actual shortage. If the 200,000 excess coal miners could be transferred to the steel mills the coal problem would be solved and the steel mill shortage much relieved. Mr. Alexander closed with the statement that Congress needs help in framing a substitute for the existing inflexible three per cent limit act. The new law must take into account the transitory nature of economic problems and the permanence of social ones.

The first speaker of the afternoon session was the Hon. W. L. Huggins, Justice of the Kansas Supreme Court and framer of the Kansas Industrial Court Act. He started his argument from the premise that force or power is an inseparable attribute of all government. To prove his point he quoted from Magna Charta, the Declaration of Independence and the Constitution of the United States. He then went on to say that organized labor had issued a challenge to the power of government which must be met. No one questions the right of labor to quit individually or collectively, with or without reason, but the prevention of other men from working is contrary to all American ideas. The railroad strike of 1894 was cited as an example of a typical strike and the action of President Cleveland in calling out troops to protect the public interest as a proper reply to such a challenge. In discussing the Kansas Industrial Court Act, Judge Huggins denied that that act imposes involuntary servitude or denies the right to quit work. On the other hand, it does prohibit involuntary idleness. He stated his belief that the vested right of the organized labor member in his job, which is the basis of the union labor movement, is really communism. The speaker announced that he was a strong believer in the shop union. His last word was that a nation wide strike is war and that no government can permit it and live.

Following Judge Huggins, Senator Arthur R. Baxter of Indianapolis told of his experiences in the Indiana Senate. He used them to support his contention that business men ought to take more interest in political matters and particularly to hold office in municipal, state and national governments. He pointed out that twenty out of thirty registered lobbyists in Indiana were representatives of the labor interests.

Prof. G. W. Dyer, professor of social science at Vanderbilt University, gave one of the most picturesque explanations of the law of supply and demand that we have ever been privileged to listen to. Starting from the fact that when our form of government was originated politics were all-important, he traced our national development as affected by the Industrial Revolution to show that everything has been changed so that economic laws now govern. In spite of this we still send lawyers who have no theory of industrial life to represent us in Congress. He said that if business were really free it would be subject to natural laws and there would be no crises or panics. Also that the wise employer knows that the highest paid labor is the cheapest in the end and vice-versa. Combatting the claim of the socialist and communist he maintained that wealth is produced by brains and that unless the fallacy that it is produced by labor and stolen by the employer is exploded our present industrial civilization will soon pass away. The speaker went on to explain his idea of the difference between industrial and moral obligations. He then said that the farmer is working on a supply and demand basis while organized labor is working under an artificial situation created by substituting the living wage theory for natural laws. As a result the farmer is paying tribute to the organized classes of the community and is suffering correspondingly. When he discovers the real truth of the matter results may be expected.

The speaker at the dinner was Laurence Lyon, editor of the London *Outlook* and his subject was "The New Diplomacy." He had a real message to deliver and it was received with careful attention by a large attendance.

Labor's Legislative Program

During the last session, held Thursday morning, much interest was shown in the masterly address delivered by Walter Gordon Merritt, counsel for the League for Industrial Rights, who outlined the "Legislative Program of the American Federation of Labor." Mr. Merritt stated that the decisions of the United States Supreme Court during the past twenty-five years had rounded out a policy that had placed the open shop and the rights of individuals as an integral part of the constitution of the United States. The court has held picketing to be illegal, he pointed out, and that the anti-injunction laws are a violation, and the general decisions have all been to the purpose that "thou shalt not deny protection to business."

Mr. Merritt stated that the legislative program of the labor federation included a repeal of the picketing laws, the repeal of the anti-injunction laws and a repeal of the state constabulary

laws and that all of this part of the program aimed to wipe out restrictions to action by labor organizations.

But most important of all, according to Mr. Merritt, is that portion of the plan of the American Federation of Labor known as "No restriction to the right to strike." This, the speaker asserted, would work a hardship on society in general, would be an opening wedge toward closed shops and is an issue that organized society must combat.

LOWELL'S APT COMPARISONS

Perhaps the speech that brought forth the most comment and applause was that which was delivered by Sherman J. Lowell, National Master of the Grange and from Fredonia, N. Y. Mr. Lowell discussed "The Labor Problems of the Farmer" and his remarks were clothed in frank, straightforward language. He was frequently interrupted by prolonged applause and the truth and logic of his remarks, even when directed at the discrepancies found in industry, were appreciated by the members of the association.

"Organization in capital set the example for organization in labor," Mr. Lowell declared, "and years ago capital pinched labor cruelly. Now capital is getting paid back. When you run a race—and that is all this life really is—you should run it honestly. But if you try to trip the other runners, they are sure to trip you and neither of you will gain by it. Labor unions have been on the one side tripping employers, and employers have also been doing their share of the tripping. The only sort of organization that is of benefit or that will be enduring is the one in which the welfare of all is considered no matter who they are. I have no patience with an organization that says that one man won't work and another will or that any body of them will quit because one man has quit.

"A short time ago a representative of labor came to me with the proposition that the farmer and the working man should get together because by the number of votes we would control we would have things pretty much our own way. He thought that I would be fool enough to fall in with a program of less hours, greater pay and cheaper food products."

The last speaker of the meeting was Robert S. Binkerd, vice chairman of the committee on public relations of the Eastern railroads, who outlined the relation of the railroads to the metal-working industry and stated that it was the aim of the roads to reduce poor equipment and operating expenses by Sept. 1 of this year when it was anticipated that the roads would be in the best condition they had ever been.

RESOLUTIONS PASSED

By a resolution that was passed it was decided to contribute $5,000 to the Industrial Conference Board. Another resolution that was passed set aside $5,000 for publicity work during the coming year and a third urged industrial training as a means of getting better workmen.

The nominating committee put forth the following candidates who were unanimously elected: W. W. Coleman, the Bucyrus Co., Milwaukee, Wis., president; J. B. Doan, the American Tool Works Co., Cincinnati, Ohio, first vice-president; Paul C. DeWolf, the Brown & Sharpe Manufacturing Co., Providence, R. I., second vice president; and J. W. O'Leary, Arthur J. O'Leary & Son Co., Chicago, Ill., treasurer.

The councilors with terms expiring in 1925 elected were as follows: George P. Aborn, the Worthington Pump & Machinery Corp., East Cambridge, Mass.; Paul T. Norton, the Case Crane & Engineering Co., Columbus, Ohio; George L. Brunner, the Brunner Manufacturing Co., Utica, N. Y.; Harold C. Smith, the Illinois Tool Works, Chicago; A. F. Cook, the Fawcus Machine Co., Pittsburgh, Pa., and F. B. McBrier, the Erie Steam Shovel Co., Erie, Pa. Horace P. Dix of the Wilmarth & Marmon Co., Grand Rapids, Mich., was elected to fill the unexpired term of Joseph F. Cooley, the Hartford Machine Screw Co., Hartford, Conn., as a councilor until 1924. Justus H. Schwacke, William Sellers & Co., Inc., Philadelphia, was elected honorary councilor.

The convention adjourned with a meeting of the new councilors and the officers of the association at noon on Thursday. A luncheon was served following the close of the convention at the Astor.

Substantial Sales Mark Buffalo Trade

Railroads are showing considerable activity in the Buffalo district, coming into the market for rails, switches, frogs, axles, all sorts of maintenance material and considerable machinery. The allied car building industry is inquiring for substantial tonnages of steel and some contracts for machinery are being allotted.

Builders of various types of machinery are active, but not so much so as in neighboring markets. Machine tool manufacturers report substantial sales and lively inquiry.

The Lackawanna plant of the Bethlehem Steel Co., is practically out of the market for major products and is experiencing a substantial inquiry for the last half. No prices have been fixed for the last half and orders are only being taken with the understanding that price is to be fixed at the time of delivery.

Steel and iron plants in the Buffalo district are suffering from a labor shortage, this condition prevailing in most of the factories. The Lackawanna plant, for instance, which has between 8,000 and 8,500 men working, could probably use another thousand men if they could be obtained.

Receiver Named for New Home Company

Judge Anderson of the United States District Court has appointed Charles N. Stoddard of Greenfield, Mass., receiver for the New Home Sewing Machine Co., of Orange, Mass. A petition for a receivership was filed recently by Charles S. Scarborough of New York, a former president of the company and represented as the heaviest stockholder with a creditor's claim for $20,000. It is stated the company is without quick assets, but is solvent, with assets of approximately $4,000,000 as against liabilities of $1,200,000. Controller Moore of the company testified that while gross earnings were $500,000 to $600,000 larger last year than in 1921, the company had a net loss for 1922 of $269,000.

Automotive Engineers Discuss Features of Fleet Operation

At the regular meeting of the Metropolitan Section of the S.A.E. held on April 19 at the Automobile Club, New York, Edward E. La Schum read an interesting and well received paper on the "Engineering Features of Fleet Operation." The paper is printed on page 617 of this issue of the *American Machinist*.

J. F. Winchester of the Standard Oil Co., and F. C. Horner of the General Motors Co., gave written discussions on the paper. Mr. Winchester stressed the importance of standardized parts and stated that unlike Mr. La Schum, he had not found it particularly hard to get uniform specifications for his company when he sought them. However, he pointed out that it was a lamentable fact that all standard part catalogs gave only general information to the motor fleet operator. He also urged the formulation of a practical standardized cost system so that operating and maintenance costs of various firms may be compared.

The discussion of Mr. Horner corroborated the statements made by the two gentlemen who spoke before him. In addition he briefly related the stringent inspection methods carried on in European countries. Each car, he said, has a monthly record card attached to it which has every repair marked which occurred for a specific month. Furthermore, each car is inspected nightly and it is by these "stitch in time" methods that costs are kept down and accidents avoided. As an example, it was found that by properly inspecting the steering mechanism, accidents due to broken steering parts fell off 30 per cent.

Locomotive and Freight Car Activity

Reports filed by the carriers as of April 1, showed that the railroads of the United States had 50,107 serviceable locomotives on that date. This is the largest number the railroads have ever had, according to the records of the Car Service Division which go back as far as August, 1920. The nearest approach to that figure was on July 1, 1922, the date on which the strike of railway shopmen began, at which time there were 50,003 serviceable locomotives.

Locomotives in need of repair on April 1 this year numbered 14,452 or 22.4 per cent of the total number on line. This was a decrease of 1,179 compared with the total on March 15, at which time there were 15,631 or 24.2 per cent.

A total of 8,242 new freight cars of various classes and 208 new locomotives were installed in service during the last fifteen days of March.

This brought the total number of new freight cars installed from Jan. 1 to April 1, to 39,172, while 935 locomotives were placed in service during the same period. Of the new freight cars installed, 2,197 refrigerator cars were placed in service by railroad owned private refrigerator companies.

New freight cars on order on April 1 totaled 107,453, or an increase of 1,117 over the total number on order on March 15. There were also 1,974 locomotives on order on April 1, compared with 2,113 on March 15.

Gear Manufacturers Have Three Busy Days at Cleveland Convention

CHARACTERIZED by its usual earnestness and hard work, the American Gear Manufacturers Association held its seventh annual convention in Cleveland at the Hotel Cleveland, Thursday, Friday, and Saturday, April 19, 20 and 21. With short intervals allowed for recreation, sessions were continuous from noon Thursday until 5:30 Saturday. The morning of Thursday and the afternoon of Friday were devoted to registration and committee meetings and to sight-seeing.

Representatives and guests at an informal dinner on Thursday were addressed by R. S. Holding, Jr., of the Brown & Sharpe Mfg. Co., on "One Half Hour in the Far East." Mr. Holding has spent two and one-half years in the Far East and gave a talk on economic and political conditions in which the keenest interest was displayed.

F. W. Sinram was the toastmaster at the informal banquet held Friday evening at which the Very Reverend F. S. White, Dean of the Trinity Episcopal Cathedral, Cleveland, spoke on "What Happened to the Shot. the Sound of which Went Round the World." Col. L. P. Ayres, vice-president of the Cleveland Trust Co., spoke on "How Long Will Prosperity Last?"

Industrial Psychology

An interesting reference in Col. Ayre's talk was to the likelihood that the business cycle is due to no law of nature but to the state of mind of the leaders among business men; it is psychological. He implied that the curve could be straightened out if the proper leaders should fail to look for the periods of decline and depression. He predicted that our next depression will be due to freight car shortage and shortage of labor, pointing out that when labor is fully employed manufacturers begin to compete for it, efficiency drops, and prosperity declines.

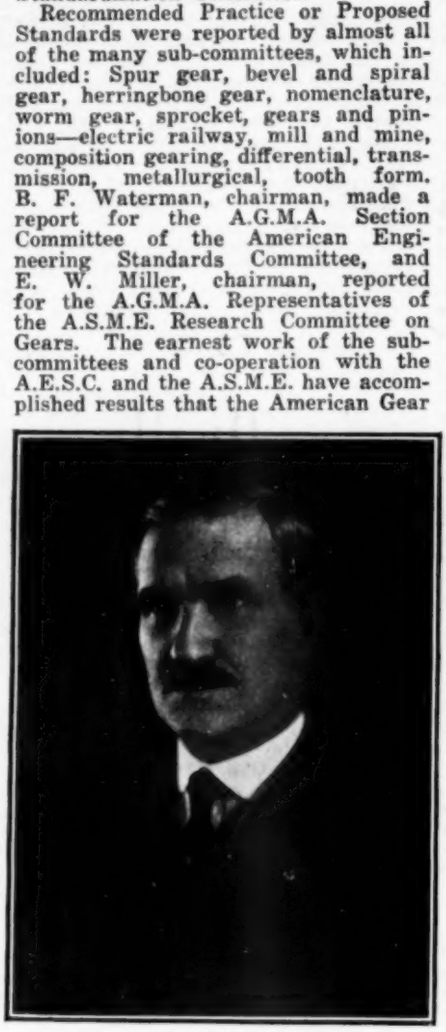
At the banquet announcement was made that Geo. L. Markland, Jr., of the Philadelphia Gear Works, was elected president to succeed F. W. Sinram, who has held the office since the formation of the organization in 1917. The retiring president in token of the esteem in which he is held by the members of the A.G.M.A. and in appreciation of his faithful work during his six years in the chair, was elected Honorary President of the Association for life.

A. W. Copland, of the Detroit Gear and Machine Co., was elected first vice-president; B. F. Waterman, of the Brown & Sharpe Mfg. Co., second vice-president and C. F. Goedke, of the Wm. Ganschow Co., treasurer.

Members elected to serve for three years on the executive committee were; B. F. Waterman, Geo. L. Markland, Jr., A. W. Copland and R. P. Johnson, of the Warner Gear Co. C. B. Hamilton, Jr., was elected to complete the unexpired term of J. B. Foote, deceased.

The great advantages to be derived from standardization were emphasized by President Sinram in a pre-convention message to members. That these advantages are recognized by the many sub-committees was indicated by the progress reports submitted by their chairman and by the report of B. F. Waterman, chairman of the General Standardization Committee.

Recommended Practice or Proposed Standards were reported by almost all of the many sub-committees, which included: Spur gear, bevel and spiral gear, herringbone gear, nomenclature, worm gear, sprocket, gears and pinions—electric railway, mill and mine, composition gearing, differential, transmission, metallurgical, tooth form. B. F. Waterman, chairman, made a report for the A.G.M.A. Section Committee of the American Engineering Standards Committee, and E. W. Miller, chairman, reported for the A.G.M.A. Representatives of the A.S.M.E. Research Committee on Gears. The earnest work of the subcommittees and co-operation with the A.E.S.C. and the A.S.M.E. have accomplished results that the American Gear



GEORGE L. MARKLAND, JR.

Manufacturers Association may justly be proud of, and which are having direct economic effect on many industries.

At the Saturday luncheon, Frank A. Scott, President of the Warner & Swasey Co., gave a talk on "Industrial Relations."

There was no lack of technical addresses during the convention. E. C. Smith, Chief Metallurgist of the Central Steel Co., Massillon, Ohio, spoke on "What Does the Microscope Tell Us?" Mr. Smith's paper and the lantern slides that accompanied it showed the value of the microscope in determining causes of failure, in predicting performance, and as an aid in exactness in the manufacture of gears.

E. J. Lees, of the Lees-Bradner Co., Cleveland, Ohio, read a paper, which was illustrated by slides, on "Grinding and Measuring Involute Gear Teeth." He explained the principles, construction and operation of the Lees-Bradner No. 10 Gear Grinding machine.

Wilfred Lewis, in an illustrated talk, explained the special gear testing machine of his design. It is probable that a further development of this machine will be used in making tests, particularly of the effect of speed upon the strength of gear teeth, under the direction of committees of the A.G.M.A. and the A.S.M.E.

S. P. Rockwell, a consulting engineer, of Hartford, Conn., read a paper on and gave demonstrations of, the determination of the grade of steel by observation of the characteristics of the spark when the sample is held against an abrasive wheel. The following brief extract is from the paper: "It is doubtful if one could estimate carbon within ± 0.10 per cent unless one had standardized on grinding wheel speeds, type and grade of wheel, and had analyzed steel standards from the same heat as the unknown. Under these conditions one may estimate carbon to ± 0.02 per cent for the lower carbon steels and to within ± 0.05 per cent on the higher carbon steels with surety. With alloy steels the carbon content may also be determined as closely as for the straight carbon steels unless the alloying elements are very high, such as high-speed steel. The element chromium can readily be picked out in ranges of 0.30 per cent. Nickel below 1 per cent is somewhat difficult to determine as yet, though 1.5 and 3.5 per cent nickel steel are readily discerned. With tungsten one may readily estimate minute traces and distinguish between 2.5 and 8 per cent up to and including the two grades of high-speed steel. Nickel chromium steels may be sorted as closely as S.A.E. specifications."

K. L. Hermann, of the Studebaker Corp., in an illustrated talk on "Tooth Forms of Automobile Gears after Cutting, Hardening and Grinding," states that quietness depends upon the accuracy with which gears are cut, and told of good results obtained.

The Association demonstrated its interest in the subject of cost accounting by devoting to it the last half of the last day of the convention.

S. I. E. Discusses Many Interesting Topics

THE TENTH annual convention of the Society of Industrial Engineers was held at the Hotel Gibson, Cincinnati, Ohio, April 18-20. Following an invocation by the Rev. Frank H. Nelson, the numerous delegates were welcomed by D. C. Keller, president of the Cincinnati Chamber of Commerce. Next, Joseph W. Roe of New York University and president of the society, addressed the convention. Mr. Roe said in part:

"The rush into trusts or large combinations which was in full swing 20 years ago has ceased. The general impression that our huge plants have swallowed American industry bodily and that the small plants are gone, is far from true. Out of 290,105 manufacturing establishments reported by the United States census in 1919, there were only 1,021, or less than 0.4 per cent, which employed more than 1,000 wage earners, and only 2,770, or less than 1 per cent, employing over 500.

A paper on "Scientific Administration" was read by C. U. Carpenter, of Dayton, Ohio. Prof. Gano, of the University of Cincinnati presided at the dinner meeting Wednesday evening, at 6 o'clock. The topic of discussion after the dinner was "Co-operative Education." At the 8 o'clock meeting, John J. Becker, of the Cincinnati & Suburban Telephone Co., presided and a paper was

read by Col. Dunn, of Detroit, on "The Executive as an Industrial General—Lessons from the World War." Ernest Du Brul, of Cincinnati next spoke on "Economics and the Smaller Plants" and R. R. Wasson read a paper on "Selling the Sales Department to the Shop Employees."

On Thursday morning the delegates spent the time visiting the plants of the Cincinnati Milling Machine Co., the R. K. LeBlond Machine Tool Co., and the Globe-Wernicke Co. At noon there were two luncheon meetings at the Gibson, that of the Board of Directors of the society, and the Research Committee. The latter was presided over by Vice-president William Baum, of Milwaukee. In the afternoon three sectional meetings were held simultaneously. The production group met with Chester B. Lord, of the National Automatic Tool Co., Richmond, Ind., presiding. The topic "Production Control System for the Special Order Shop" was discussed by chairman Lord, A. F. Trevor, Harvey, Ill. and Richard Mackay, Jr., Chicago. The personnel group met in another hall with J. J. Davis, Oshkosh, Wis., presiding. The subject "Interdependence of the Personnel Department and Foreman" was discussed, those leading being Charles Lytle, New York University, Paul Arthur, Elkhorn, W. Va., and the chairman. The accountants group discussed "The Monthly Departmental as a Business Barometer," with Noyes D. Farmer, Niagara Falls, N. Y. in the chair. Daniel E. Knowles, Chicago, and John F. Putnam, Milwaukee, led the discussion.

Annual Dinner is Big Success

Thursday evening the annual dinner was held in the ballroom of the Gibson. Dr. Otto P. Geier, of the Cincinnati Milling Machine Co., was toastmaster. The subjects were: "Relation of the Educational Institution to Industry—Especially to Plants of Moderate Size" by Dean Herman Schneider, University of Cincinnati; "How a Chamber of Commerce Can Assist in Promoting the Prosperity of Local Industries" by Roland B. Woodward, general secretary of the Chamber of Commerce, Rochester, N. Y.; "Detroit's Aims and Accomplishments" by J. H. Goldie, executive secretary, Safety Council, Board of Commerce, Detroit; "Cincinnati's Objective," by W. C. Culkins, executive vice-president of the Cincinnati Chamber of Commerce.

On Friday, Mrs. Dorothy Kuhn Minster, industrial hygienist and executive secretary of the Cincinnati Health Conservancy laboratories, addressed the convention on "The Dollars and Cents of Industrial Health" her main point was that industrial health was not merely a social service but a sound business proposition.

A part of Friday's program consisted in a visit to the Lodge & Shipley Machine Tool Co., while some of the delegates went to the American Rolling Mill Co. at Middletown, Ohio.

At dinner Friday evening W. G. Sheehan, Detroit, was chairman. The general topic was "How and To What Extent Can Employees Participate in Management." Those leading the discussion were: Daniel Bloomfield, Boston; John P. Frey, editor *International Molders Journal*, Cincinnati; Chas. R. Hook, general manager of the American Rolling Mill Co., Middletown, Ohio, and John Calder, Lexington, Mass.

Great Britain's Trade and Conditions Show Slow Improvement

By OUR LONDON CORRESPONDENT

THE figures relating to money values of overseas trading by Great Britain last year have, of course, been available for some little time. They suggest a visible balance against England of about £166,000,000, when allowance is made for bullion and specie. Against this we have set our "invisible exports," which in the past have more than balanced the apparent excess of imports, but of which the value can only be estimated. Certain of the Board of Trade officials have recently made such an estimate. Allowing for diamonds, the total excess of imports is put at about £210,000, the total net invisible exports being valued at about £325,000,000, leaving about £155,000,000 available for overseas investment. The estimated total, is slightly lower than the value for 1913 and not much more than half the value for 1920; it is made up mainly of net income from investments abroad £175,000,000, net national shipping income £110,000,000, with, besides other services, £30,000,000 for commission.

Two highly satisfactory statements may be made. One is that the officially recorded unemployed work people have for two months steadily declined in numbers and are below the million and a quarter mark. The other relates to public finance. When the budget was introduced a year ago it was expected that the excess of public revenue over public expenditure would be slight. As it has turned out, the surplus exceeds 101½ million pounds and is real, that is it arises chiefly from taxation and not solely, as in the past year or two, from the sale of war stocks. Without going into details it may be stated that the balance on the right side is almost entirely due to reduction of expenditure as compared with the estimates, the total revenue being practically as budgeted, although some of the items show a very great variation from the original estimate. Thus, owing chiefly to the collection of arrears, the Income Tax has produced 50 millions more than was expected. The chief failures were the Excess Profits Duty and in the special miscellaneous revenue, which, of course, results largely from the sale of war stock.

How the Ruhr Affects England

The affects of the Ruhr troubles on industry have been both direct and indirect, and the iron and steel industries generally have found that prices have increased. In shipbuilding, the advance of the motor ship has been obvious. Still, despite reports of a number of orders, this industry has for quite a time been comparatively quiet with about a third of the workpeople concerned unemployed. On the other hand, shipbuilding seems to have been flourishing in Germany, and Great Britain has of late supplied quantities of material for that purpose. Leaving out of account tool and special steels, English steel-makers are much happier and, according to reports, published, some are fully booked up to August and even later.

Rising prices of raw materials naturally form a handicap leading to increased prices for finished articles, but so far there has been little increase of prices in the engineering industries which, with the exception of one or two branches, still languish. Complaints have been heard as to disorganization of railways and, although a few orders for new rolling stock have been placed by two of the railway amalgamations, private orders have not been numerous, and wagon works are not fully employed. The position as regards motor cars has improved somewhat, and one of our firms supplying relatively cheap cars now has an output of 425 cars a week. Here some slight increase in exports has been recorded, though the value is not nearly equal to that of similar imports. Up to the present, in fact, motor car manufacturers have been somewhat disappointed. Exports have been small and generally the home trade has not been lively.

Call for Light Autos

As for some time past, the largest sale has been for light cars; experiences of manufacturers of the biggest and best cars have varied greatly. Complaints are still made of the competition of government stocks, not only in Great Britain, but also on the continent. Indeed, it has been suggested that chassis imported from war stock overseas should pay a duty similar to that on new chassis. The suggestion has also been made that parts of cars can get into Great Britain without payment of duty.

The importer of ball bearings, for instance, must expect to have personal inquiries made as to the ultimate use of bearings brought in, and one firm of machine tool makers has found it advisable to take the inspector direct to the tools to which the bearings have been applied.

The cycle industry has improved both at home and abroad, and Holland, always a good friend in this direction, has been buying of late.

The motorcycle industry has been better engaged also, and some firms have largely increased their exports. A few even of the manufacturers of commercial vehicles have reported better conditions. Things might be worse. Optimists in the machine tool trade suggest some improvement, though second-hand tools compete heavily with new, and in the agitation over aircraft some machine tool people see prospects of opportunities.

Some measure of research is being undertaken in connection with the file industry of Sheffield, and attempts are being made to standardize cross sections. The local technical society concerned recently investigated the use of machine-ground chisels for file production, as compared with hand-ground and whetted, the advantage lying in every case with the machine-ground appliance. It is probable that more than one firm engaged in the industry has made somewhat similar investigations of late. A well-known maker has discarded the use of cast steel in favour of a Siemens-Martin steel, as the best for the purpose, having in view file life. Sheffield has of course for some time been making files of lighter section than common here in the past, the purpose being to meet American competition.

Chicago Prosperous but Cautious

Demand for machine tools in the Chicago district has not diminished. Several concerns report sales in very good volume during the first week after an increase in prices was announced by them. Since advance notice of the increase was given they are wondering why those who made purchases after the increase became effective failed to do their buying the week before. The only explanation offered is that this is proof of "prosperity."

Chicago representatives of the American Tool Works Co., Monarch Machine Tool Co. and Niagara Machine Tool Co. report the volume of business offered them as being so heavy that deliveries on orders taken now are not promised before July or August.

The purchasing department of the Atchison, Topeka & Santa Fe R.R., will issue a list of machine tools wanted in the near future according to a statement recently made at its Chicago office. The Great Northern R.R. has recently announced that the system's improvement budget for the year totals thirty million dollars. The major portion of this sum will be spent for additional locomotives and cars, but improved shop facilities are included.

Although industry in the Chicago district is humming along at a merry pace, both producers and consumers are proceeding with caution and there is no likelihood of a runaway commodity market. Reports from various industries indicate some slackening and are widely enough distributed to suggest that last month may have seen the season's peak of activity.

Demand for steel from warehouses is active, but stocks are better balanced than they were a short time ago. There is a particularly heavy call for structurals, galvanized sheets and bars. Railroads are important buyers, finding it difficult to obtain deliveries on steel bars under contract.

Labor Well Employed in the Pittsburgh District

With steel products advancing in price during the past three or four months, a firm and stable basis has been established in the machine tool business in the Pittsburgh district. Orders coming in to the jobbers give evidence that the mills are contemplating many improvements in their machine shops, and in several instances large additions to their plants. There had been some accumulation of stocks by distributors, but the general trend of sales is upward week by week, and these stocks are being moved pretty generally.

An air of activity pervades the makers of machine tools in this district, although there are only a few, most of the business here being done through jobbers and distributors. In the Braddock section of the industrial area, the workers at the Pittsburgh Tool Co. are working full time and are especially busy in the making of small tools and accessories that are sold to the plants of the steel companies here.

Notwithstanding the reports of labor shortage, the machine shops and factories seem to be well manned, and there is scarcely a plant of any kind in the iron and steel industry that is not operating from 85 to 95 per cent of capacity, which means that machinery and machine tools are in demand to keep up the wear and tear of the manufacturing establishments. Raw materials and labor costs are stiffening, but it seems that the steel mills are willing to pay any reasonable price to get necessary material and tools with which to turn out their finished products, and this gives a firmness to the market that is giving confidence to the industries of the country.

All St. Louis Shops are Kept Busy

Expansion is the order of the day. There is no hesitancy on the part of any concern to make needed improvements in its existing equipment and to purchase new supplies to handle the increasing demand. All the larger shops report that they are working full blast, having enough work on hand to keep them going for at least three months. The Fulton Iron Works, Busch-Sulzer Bros.-Diesel Engine Co. and Lehman Machine Co. are among those reporting a capacity business.

Smaller concerns, however, are not as active as the larger ones, but there is no apparent reason for this condition.

Railroads are still the best buyers in the market for machine tools. The Missouri-Kansas-Texas R.R. is purchasing new equipment for its shops and also installing machinery in its new plants at Dennison and Bellmead, Texas. The Missouri Pacific R.R. is planning the erection of a new machine shop in St. Louis.

The St. Louis & San Francisco R.R. has a building project in view for a new shop here as a part of the extensive improvement program that it recently announced.

L. A. Carter, president of the Lehman Machine Co. is well pleased with the volume of business the concern is doing and has recently installed new equipment to the amount of $15,000 to take care of the increased demands on the plant. The Lehman Co. manufactures engine lathes, and have enough orders on hand to keep its plant going full time for at least three months to come.

Tells Editors Aims of Newcomen Society

At a luncheon given at the Bankers' Club in New York by L. F. Loree, president of the Delaware & Hudson R.R. and John R. Dunlap, president of the Engineering Magazine Co., H. W. Dickinson, honorary secretary of the Newcomen Society and curator of the Science Museum at South Kensington, met twenty of the editors and publishers of American technical magazines. Mr. Dickinson outlined the purposes and functions of the Newcomen Society which was formed to study the history of engineering and technology. Short speeches were made by Henry R. Towne, of Yale & Towne Mfg. Co., W. L. Saunders, Chairman of the Board, Ingersoll-Rand Co., Fred H. Low, editor of *Power*, David Beecroft, executive editor, Class Journal Co., and E. J. Mehren, vice-president, McGraw-Hill Co., Inc.

Working at Capacity in Milwaukee

Demands upon metal trades shops continue to increase steadily and orders have now reached the point where the securing of an adequate labor supply of all classes is becoming more and more a serious problem. There are many shops in Milwaukee and vicinity which have brought operations to 75 or 80 per cent of their normal capacity and are obliged to stop there because it is not possible to get men for further use of available capacity. Perusal of the classified advertising pages of local newspapers reveals that requests for labor by the metal trades group are more numerous than at any time in the past two years. It is also to be noted that employers in other important centers of the metal trades are advertising steadily for help in competition with local industries. This refers almost entirely to highly skilled help. Local employers report that they are not losing their men to outside shops. The number of transients is said to be smaller even than normally.

The growing shortage of labor and the limitations it imposes on efforts to extend production has not yet caused any appreciable slowing in the demand for machine tools, yet it is becoming more and more apparent that firms are becoming more discriminating in the type of tools they want. The best call is for tools of manifold purposes and having high production records which by replacement of the older and standard designs not only will make increased production possible but reduce the need for help at the same time.

Automatic Features

The engineering and designing departments of the metal working machinery shops at present are concentrating every effort to produce advanced types with automatic features as the development of older and slower machines to meet the new conditions which demand greater output with the minimum number of hands. When the war ended this aim was foremost in the minds of engineers and the work was carried on through the period of depression, but hardly with the vigor that is evident now, when more tangible manifestations of supply and demand are at hand, and it is generally recognized that the lack of men must be overcome, if at all, by machines that will at once save labor without sacrifice of production.

"Machine tool business is steadily getting better though there is plenty of room for improvement still," is the laconic phrase with which the monthly business and financial summary compiled by the largest bank in Milwaukee described the condition of this group. It adds that "Heavy machinery plants are operating at normal capacity." Comment is elsewhere made that woodworking factories, plumbing and builders' hardware supply houses and electrical supply concerns are extremely busy. Automotive parts and accessories companies are receiving all of the business they can take care of. The past month witnessed a substantial increase in motor truck sales. A large firm manufacturing automotive engines experienced an increase of 35 per cent in sales, and 100 per cent in unfilled orders over the corresponding period in 1922.

Business Items

A direct factory branch for handling the company's trade in the southern territory has been established at High Point, N. C., by the Philadelphia Belting Co., with Edwin J. Payne, of Baltimore, in charge as Southern manager. The branch is located in the Hotel Arthur building at High Point.

A factory branch has been opened in Atlanta, Ga., at 66 Forsyth St., by the Chicago Belting Co., of Chicago, the entire Southeastern territory being handled by the company from the new branch. Benjamin L. Willingham and B. Hodges, both of Atlanta, are in charge of the branch, which carries a complete line of the company's products as well as accessories.

The Hunt Manufacturing Co., Baltimore, Md., has purchased the entire plant and stock of reamers of the Mergenthaler Co. of that city. For the present the shop will be operated on special and contract work such as crank shafts and screw machine products. The manufacture of Mergenthaler reamers will be continued by the Hunt Manufacturing Co.

The Hanover Motor Car Co., Buffalo, has purchased the Parenti Motor Car Co., Buffalo, from the receivers for $225,000. The assets of the company consisted mainly of eleven acres of land.

The E. J. Manville Machine Co., Waterbury, Conn., machinery manufacturer, has increased its capital stock from $100,000 to $200,000.

The Automatic Gear Co., Atlanta, Ga., has leased for a term of years, the first floor and basement of the building at 1024 Commonwealth Ave., Boston, Mass. as a New England showroom.

The Chicago office of the Zeller Lacquer Manufacturing Co. has been moved to 551 West Lake St.

The Pennsylvania Railroad has awarded to the Hugher-Foulkrod Co., Philadelphia and Pittsburgh, a contract for building the machine and erecting shops at the Juniata yards, Altoona. The work is to be rushed and the shop finished by Fall. The machine section of the plant will be in the same building, and will be capable of turning out the largest machinery required.

M. & J. Goodman, specialists in the manufacture of wiping cloths and other materials used in the machine trade, will move into their new building, Platt Ave. and East 79th St., Cleveland, Ohio, soon. The concern has recently opened offices in the Realty Trust Building, Philadelphia, and also in Chicago.

The American Candy Pulling Machine Co. of Milwaukee, Wis., has been granted a charter to manufacture special machinery for confectioners, bakers, etc. The authorized capital is $100,000. Jerome Bond, Blair McQueen and Gerald P. Hayes, attorney, 425 East Water St., are the incorporators.

The Thomas-Kerns Co. has purchased the entire assets of the Griswold manufacturing Co., Rock Island, Ill.

Frank D. Chase, Inc., 645 No. Michigan Blvd., Chicago, has been engaged by Bucyrus Co., South Milwaukee, Wis., to design and erect a number of additions to the machine shops. A new steel foundry and additions to the gray iron foundries were made during the past year.

Fire destroyed the Hurlburt-Rogers machine shop, branch of the Flather Machine Co., South Sudbury, Mass., at a loss of $25,000 approximately.

At a meeting of stockholders of the Whitaker-Glessner Co., LaBelle Iron Works Co. and Wheeling Steel and Iron Co., held at Steubenville, Ohio, they approved of the merger of the three concerns into the Wheeling Steel Corp.

The Triplex Machine Tool Corp., New York, has appointed Neff, Kohlbusch & Bissell, 1045 North Washington Boulevard, Chicago, its representative in the Chicago territory. The corporation makes bench lathes, milling and drilling machines.

The Fulton Supply Co., of Atlanta, Ga., one of the largest Southern jobbers of machinery, mill supplies, and tools, has moved into a new building constructed for the company at 70 Nelson St., and plans the immediate expansion of its business in the Southern territory.

Personals

F. O. HELTZEL who has been vice-president of the Heltzel Steel Form and Iron Co., Warren, Ohio, since its organization ten years ago, has resigned from the company.

JOHN R. POYSER, for the past 12 years secretary of the Canton Foundry and Machine Co., recently resigned that position to become sales manager of Doelger & Kirsten, Milwaukee, manufacturers of steel shears.

J. P. WELLS of the Wheeling can department of the Whitaker-Glessner Co., Portsmouth, Ohio, has been transferred to the Columbus office of the department and has taken over the Ohio district office.

C. J. COOPER, JR., merchandising manager of the Wise-McClung Mfg. Co., New Philadelphia, Ohio, has resigned his position as eastern sales manager to accept a position as assistant to the general sales manager for the Syracuse Washing Machine Co., Syracuse, N. Y.

OSCAR OLSON, who has been connected with the Columbia Steel Co., Elyria, Ohio, for the past twenty years has resigned to become vice-president and general manager of the newly organized Detroit Steel Corp., Detroit, Mich.

A. E. ANDERSON has been appointed Southern manager for the Moloney Belting Co., Chicago. Mr. Anderson's headquarters will be in Atlanta, Ga.

DANIEL EDWARD has been appointed manager for the Moloney Belting Co., Chicago, in the New Orleans La. district.

JULIUS SCHACHNER, Charlotte, N. C., has been named a general manager of the Moloney Belting Co., Chicago. Mr. Schachner was formerly with the McLeod Belting Co., Greensboro, N. C.

O. T. JENKINS, Dallas, Texas, will represent the Cutler-Hammer Manufacturing Co., Milwaukee, Wis., in the Southwestern district covering the states of Oklahoma and Texas.

FRED E. LAMPE, formerly associated with the Powers Accounting Machine Corp., New York, has accepted a position as production manager of the Wales Adding Machine Co., Wilkes Barre, Pa.

WILLIAM L. HOFFMAN, who recently terminated his connection as Philadelphia district sales manager for the Brier Hill Steel Co., Youngstown, Ohio, when that organization was taken over by the Youngstown Sheet & Tube Co., has entered the business of dealing in mill, mine and railroad supplies. Mr. Hoffman is well known in the eastern iron and steel trade having been Philadelphia manager for the Brier Hill Co. for the past six years.

BRENT A. TOZZER, Cleveland sales manager for the Niles Tool Works, Hamilton, Ohio, and Pratt & Whitney Co., Hartford, Conn., will give a non-technical talk, illustrated by 150 lantern slides at the A.S.M.E. meeting in Toledo, Ohio, May 3. Mr. Tozzer secured the data and illustrations while on a fourteen months' trip through Japan, China, Siam, Java, India and other parts of the East. The talk is entitled "Rambles in the Orient."

J. M. HIBBARD, president and treasurer of the Automobile Crankshaft Corp., Detroit, Mich., has been elected president of the Hibbard-Robinson Co., Atlanta, Ga., that has been recently formed as an automobile agency in the Southern territory.

JOHN C. COTTER, formerly with J. H. Williams & Co., Brooklyn, is now with the Western Drop Forge Co., Marion, Ind., in an executive position.

Obituary

Dr. SCHUYLER SKAATS WHEELER, inventor, engineer and physicist and president of the Crocker-Wheeler Co., of New York and Ampere, N. J., died suddenly of angina pectoris, April 20, at his home in New York City. Dr. Wheeler was famous all over the world for his inventions of electric appliances, drives and motors. He was the designer of the "C. & C." motor, the first manufactured small motor for practical power work in the world.

Dr. Wheeler was the organizer and founder of the United Engineering Society. He bought in Europe and brought to this country the Latimer-Clark library, said to be the largest collection of rare electrical books in existence, and presented it to the American Institute of Electrical Engineers. He was for a time president of the American Institute of Electrical Engineers. He was a member of the American Society of Civil Engineers, the Society of Mechanical Engineers and the United Engineering Society. He was the author of a number of articles and works, having to do with his profession.

He was a director of the City Trust Co. of Newark and the Helicopter Co., Inc., of which he was also secretary.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE FACT that nearly every one now realizes the probability of a lessened demand if prices continue to advance is engendering a spirit of conservatism that justifies a renewal of confidence in the future, although in many of its aspects the outlook still suggests caution.

I had to spend the first few days of last week in the Middle West, where I had unusual opportunities to acquaint myself with business conditions.

Most merchants and manufacturers are busy filling orders already booked, but nearly all of them report that there has been a noticeable let-up in buying during the last two weeks. This they attribute to the hesitancy of retailers in increasing stocks at the higher prices made necessary by the advance in wages and to the abandonment of much building that had been planned before the cost of construction had become as nearly prohibitive as it has recently been made by the scarcity of labor and the advance in pay that skilled mechanics are able to obtain. This advance is not so much due to the demands of the workers themselves as it is to the competition of contractors who are over bidding each other to get the men they need to complete projects already under way and, until the construction now in hand is finished, it is doubtful whether much new work can be undertaken.

The retail merchant in the Middle West has also been deterred from stocking up as usual by his knowledge of the obligations that many of his best customers have assumed in order to buy the automobiles that they use. I was told that the practice of buying automobiles on time has been so encouraged that most of them are now sold in this way and that as the average man will deprive himself of almost anything rather than surrender his car, the retail trade in many cities has been much curtailed by the economies made necessary when the notes due for the automobiles mature.

These considerations and the vividness with which the depression of 1920 is remembered have made both banks and business men exceedingly careful and while their carefulness may avert anything like a boom it is also an assurance against anything like a panic or an acute crisis.

In the merchandise markets of New York much the same conditions obtain as in the Middle West. There are notably few out of town buyers in the city, and many of them are looking only for bargains which they can turn over quickly at special sales without running much risk of being caught with large inventories in the event of a decline.

It seems to be true that industry and commerce are like individuals in that they cannot work perpetually at full speed. They are capable of periodical bursts of activity which carry them to record heights, but an interval of relaxation must ensue. When wages are raised many workers seek more leisure instead of more earnings, and it has rarely happened that production has increased after wage advances. I am therefore disposed to think that the peak of industrial and commercial activity has been passed, except as it may be exceeded by the seasonal increase which is to be expected next fall.

There are as yet few statistics to bear me out, but though the total consumption of cotton by the mills during March was the greatest since May, 1917, the daily average was actually less than February. All records of iron and steel production were broken during March, but the output has already fallen off slightly as sales have decreased. The silk mills are less active. Lumber sales have fallen off considerably from their peak.

Among the other developments of the week there are none which are likely to be remembered when the business history of the year is written. The Federal Reserve ratio showed a slight decline to 75.5 per cent on an increase of $24,000,000 in bills discounted and a drop of $3,000,000 in gold reserves, but there is such a plentitude of credit that the ratio is no longer particularly significant.

The stock market has been stronger under the leadership of the railroad shares and a few industrials which are expected to report large earnings this year, but there are many who think that present prices have fully discounted the business improvement and that the large gross sales will not produce equally large profits because labor takes a greater share of them than it formerly did. This sentiment is supported by knowledge of the cautious attitude of buyers and by the fact that fabricators of goods are loath to raise prices for fear of curtailing the volume of their business.

In nearly all the markets and all sections of the country an increasing fear is discernible that a period of costly deflation similar to that of 1920 is ahead and that fear is the best assurance that such a catastrophe will be avoided. It has greatly checked the speculative accumulation of goods and expansion of inventories. It has prevented in most markets the placing of duplicate contracts in the over-eagerness to get goods, and the consequent cancellation of one when the goods are delivered on the other. It has caused the emphasis of management to be placed on the sound principle of keeping goods moving. In all of these ways it has been effective—with some conspicuous exceptions—in keeping prices within the consumers' reach. Therefore I am disposed to expect a continuance of profitable activity, though not at the present remarkable rate, as long as this caution is exercised.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.	$0.0326	$0.0322	$0.0229
Cold finished shafting	per lb.	0.0406	0.0406	0.032
Brass rods	per lb.	0.1913	0.1870	0.1533
Solder (½ and ½)	per lb.	0.30	0.2833	0.20
Cotton waste	per lb.	0.1231	0.1181	0.104
Washers, east iron (½ in.)	per 100 lb.	4.66	4.33	3.83
Emery, disks, cloth, No. 1, 6 in. dia	per 100	2.96	2.96	3.11
Lard cutting oil	per gal.	0.575	0.5575	0.608
Machine oil	per gal.	0.349	0.349	0.40
Belting, leather, medium	off list	42%	49%	48½%
Machine bolts up to 1 x 30 in.	off list	44¼%	51¼%	64½%

Two Canton Firms Are In Merger

Consolidation of the interests of the United Machine and Manufacturing Co. and the Canton Detroit Foundry Co., Canton, Ohio, is awaiting ratification of the stockholders, it has been officially announced.

L. E. Griffith of Canton is president and general manager of the United Machine and Manufacturing Co.

Discuss Pyrometer Problems

A meeting of the American Society for Steel Treating, New York Chapter, was held April 18 in the Assembly room of the Merchants' Association, the Woolworth Building. C. H. Wilson of the Wilson-Maeulen Co., was the speaker and his topic was "Some Practical Considerations in the Use of Pyrometer Thermocouples."

The Machinery Exhibit at the Leipsic Fair

High prices mar the success of the annual exposition—Many new firms and lighter types of machinery in evidence—Single-purpose machines and novelties favored — Forced absence of manufacturers from the Ruhr Valley

By OUR BERLIN CORRESPONDENT

THE LEIPSIC FAIR, since it has expanded to a large periodical Engineering exhibition, has decidedly been under an unlucky star. Whenever during the last four years the time for it drew near, something happened which severely jeopardized its success. It has become a chronicle of Germany's time of storm and stress and reflector of her restless, ever shifting economic and political life. Two years ago the streets of Leipsic were swept with revolutionary bullets which quickly dispersed the whole crowd of visitors and exhibitors. A similar effect has been produced this year, by more peaceful, but no less deadly, missiles: exorbitant prices.

The record number of over 150,000 visitors, that flocked to Leipsic attracted by the large trading opportunities, which the Fair usually offers to foreign buyers even at bargain prices, were soon impressed with the fact that a great change has taken place since the last Fair. The hospitable city of Leipsic and its inhabitants were doing their best not to delay this impression, but to impart it to the stranger as soon as he descended from the train into the magnificent railroad station, the finest and largest in Europe. The municipality of Leipsic has, in honor of its guests doubled the street car fare and the regulation prices of other municipal institutions. Private establishments, hotels, cafés and the like, quickly taking the cue, but "going one better" all combined to prepare the stranger for the surprises in store for him.

Fair mindedness was shown by not discriminating against the foreigners. German and alien visitors were "soaked" alike. To the contrary, foreigners receive preferential treatment by the salesmen. The prices quoted for export were hardly without exceptions lower by from 10-30 per cent than domestic prices. The best business that could possibly be done at the Fair was to buy for export and then sell at home—if a purchaser could be found, even at the lower export price. This "if" formed the keynote of the Fair, in fact it is the keynote to the present German business situation.

The Ever Changing Currency

During the recent landslide of the mark rate, manufacturers seem to have lost all reckoning, driving prices up from the basic material to the finished product—each link following the movement of the others or even adding impetus to it—with the result that they have reached a level, entirely out of the usual relation with the purchasing power of the mark. The individual manufacturer is caught in the network of prices. Alone he cannot follow the reverse movement of the mark rate. For concerted action a universal confidence in the duration of its present stability is required which, however, is lacking.

This was evident in the almost general attitude towards export business. Export prices that were profitable a short while ago mean today a loss, or at best no profit. Some manufacturers have readjusted their export prices to their former paper mark equivalent, but it is known that in such cases no single purchase has been transacted. The majority stuck to them and gladly booked foreign orders, in spite of the loss involved at present, arguing that at the time of delivery matters would be different.

> "The German designer's aims at progress clearly point in two directions: control and drive. Centralized control has received the greatest and most studious care. The German manufacturer seems now at last to have fully grasped the idea of it. In the matter of drive, single-pulley drive and self-contained electric drive are becoming predominant."

On the point of business, the last Leipsic Fair was a failure unparalleled in its history. As an exhibition, however, it was a decided success. One could not help being impressed with the quantity and quality of products exhibited, reflecting, as they did, an undaunted spirit and dogged energy maintained against tremendous odds. This applies especially to the Engineering Fair at which a marked progress since last year could be seen in nearly all departments, among them the machine tool industry, that forms by far the largest, best arranged and most impressive part. Over 250 manufacturers of metal-working machines and a number of wood-working machine manufacturers have exhibited over 1,500 tools. The exhibition filled a space of about 130,000 square feet. Nearly all the known makes were represented.

The first general impression received is the astonishing number of young or comparatively unknown firms that have come to the foreground, presenting tools, which in design and workmanship do not appear to differ from the leading makes. Great strides have, indeed, been made in this direction. Works, which only a few years ago had never trespassed beyond the old-timed conventional German type of tool have become thoroughly modern. This is partly due to ambition, not content any more with second and third rank, but largely reflects the change of mind which has taken place amongst users.

Up to the war and for a considerable time beyond, a surprisingly small percentage of works in the total of German metal-working firms has employed thoroughly up-to-date tools, as a matter of principle. The general run seemed to be governed by the simple truth that "a lathe is a lathe." The experiences of the war and the subsequent labor troubles have succeeded in lining up the long chain of stragglers with the front rank by universally establishing several fundamental truths in manufacturing, thereby producing a prominent change in the attitude of manufacturers towards selecting their equipment. This is a performance which in pre-war times not even the best salesmen could achieve.

A feature of the modern German tool is its well-balanced, pleasing appearance. The propaganda carried on to this effect, with the object to remove unnecessary ugliness of appearance and to apply to machine building the principles of architecture have evidently not failed to bear fruit. It is, however, somewhat striking to notice that the makers when revising the lines of their designs have paid so little heed to the exigencies of changed circumstances, that imperatively call for a removal of all superfluous weight, also. The price of castings is now an expensive item and freightage another. Both have, in comparison to pre-war times, nearly doubled. Still German designers, in dimensioning their castings, are almost as liberal as before, when the massiveness of German makes compared with the lighter American designs formed the chief argument of the German salesman. Only a few instances could be noticed, where the proper and economical distribution of weights seems to have formed an important consideration.

The German designer's aims at progress clearly point in two directions: control and drive. Centralized control has received greatest and most studious care. The German manufacturer seems now at last to have fully grasped the idea of it. In the matter of drive, single-pulley drive and self-contained electric drive are becoming predominant.

Co-operating With Electric Companies

In the latter respect the German machine tool builders have secured the valuable active co-operation of the two great German electrical firms, the A. E. G. Electric Co. and Siemens-Schuckert works, which both have made it an object of elaborate research work. As a result, the variable speed motor has been developed to a high state of perfection. That temptation in the direction of overdoing matters is not lacking, as can be seen at the exhibit of Ludw. Loewe's where a lathe of 20 in. swing was to be seen, equipped with a motor of 20 speeds. In combination with three mechanical speed changes, a range of 60 speeds is obtained.

For the design and arrangement of

the electric drive many variations could be seen. The tendency to form a compact unit out of the aggregate is strongly pronounced. The lathe of Gebrüder Böhringer mentioned in these columns in connection with last year's Leipsic Fair is still the most advanced exponent of this class. In this lathe the motor is completely encased in the headstock. So economically dimensioned is the design and so well utilized the available space that the impression is received by the casual observer of an ordinary all-geared headstock. From the information candidly given your correspondent by the makers, last year's exhibition of the lathe was somewhat premature, as the motor still suffered then from several complaints, which, however, have been successfully remedied since then. The lathe has now been put on the market and is giving satisfactory results.

New Drive Is Shown

An entirely new drive is demonstrated by the Magdeburger Werkzeugmaschinenfabrik, one of Germany's most progressive machine tool firms, making lathes, turret lathes and automatic screw machines, the latter on the Gridley design. This drive was "the" novelty of the Fair. Great secrecy is preserved concerning it by the makers. It is completely encased in the headstock and can be watched in operation, but no information whatsoever was given besides the indication that it is gearless. From the outside appearance and judging by the strong humming noise, the impression is received that it is a turbine drive actuated by oil, forced into the turbine by means of a high-speed centrifugal pump. As the drive is reversible, there may be two turbines rotating in opposite directions. An almost 100 per cent efficiency of power transmission to the spindle is claimed for this drive. Another interesting drive is seen at the exhibit, designed for large shapers. Instead of a crank and rack, planet gears are used. The driving shaft and the back-gear shaft have continuous rotation. The result is a particularly smooth reverse, almost free of shocks and vibrations, also a considerable saving of power. It is claimed that this drive reduces the motor power required to nearly one-half of the usual amount. For the drive the so-called Schmaltz-Lauer electric motor is used. The motor has considerable circumferential weight to act as a fly-wheel. Franz Braun Akt.-Ges. was showing a lathe using for the change-gear mechanism the so-called Soden gear box, which made its public appearance at last year's motor car exhibition, and which was described on page 17, Vol. 57 of the *American Machinist*. This gear box was primarily designed for motor cars, but it was to be foreseen that its principle would be applied in machine tool building. In motor cars it obviates switching from one speed to another through the whole series. It allows of changing from any one speed to any other without intermediate changes. The meshing of the respective gears is performed by pressing a button. As the original objective of this gear box indicates, it can be operated while the machine is running which proves to be an exceptional convenience.

Three firms showed tools for the machining of key shafts, a field which has been somewhat neglected up until now. Schuchardt & Schütte were showing a milling machine for machining such shafts from the solid. On Pfanter's exhibit the same operation could be seen performed on a large gear hobbing machine. Reinecker's showed a key-shaft grinding attachment on one of their horizontal grinding machines. The tailstock of this attachment is combined with a wheel dressing device, allowing the wheel to be redressed at intervals during the operation.

Curiously enough, Reinecker's exhibit showed the greatest unpretentiousness of all—nothing to attract attention, no flashy new features, only a few modest tools of conventional design, but carefully revised in all, even minor details. A toolmaker's lathe, for instance, was shown and demonstrated with pride, that bore none of the hallmarks of the pushing progressiveness seen everywhere else, but had only a few unostentatious little features like the central clamping of the tailstock pin and the clamping of the tailstock in three places, two on the outside gib and one in the middle of the bed, to ensure accurate alignment. It seems that while most machine tool builders are emancipating themselves from the long preserved conservatism, one or two leading firms are again returning towards it.

Return to Conservatism

As a striking example of the former tendency may be mentioned a new high-speed lathe especially designed for the use of stellite. At the Leipsic Fair of two years ago Gebrüder Böhringer demonstrated stellite on one of its tools as a novelty. Wohlenberg, the makers of the lathe in question, a firm noted for conservative leanings, has not lost much time since the advent of stellite in Germany. This lathe is built in one size of 24 in. swing, has 7 changes of feed and a range of 20 speeds in geometrical progression, from 32 to 856 r.p.m. A variable-speed motor of 10 different speeds is used for the drive, which if a type of from 500 to 1,000 r.p.m. is used, can be coupled direct with the spindle, thus obviating geared drive at the higher speeds.

The Titania Works showed as a novelty a machine for embossing numbers or signs in small machine parts. The feeding of the parts into the machine and its work is automatic. Another single-purpose machine not yet built in Germany was a snap-gage grinding machine made by the same firm. The width of the gage is obtained by the use of Swedish gages and the operation is automatic. Buffing is performed in the same setting by an attachment.

A handsome milling machine could be seen at the exhibit of Roscher & Eichler, a comparatively unknown firm. The overarm is designed singularly strong and wide, giving the arbor-supports a broad bearing. The latter are guided by V-gibs. The tool has a strong column, cast in one piece with the base, in which the electric motor is housed.

Hurth, Munich, another young firm, showed a key-seat milling machine with crank motion, whereby through a patented device the speed throughout the stroke is made perfectly uniform.

Heidenreich & Harbeck exhibited their shaft turning lathe, Lo-Swing type, with a cross-feed for cam shafts. This firm is building a bevel gear shaper on the Gleason principle working with two tools, which are fed alternately. Several features of this tool are protected by German patents.

The Zimmermann Works was, close by, showing a similar tool. While the former exhibits in many parts the earnest desire of a capable designer to produce an honest improvement of the original, the latter quite indiscriminately adopted features from both.

Ernest Krause & Co. were showing many new machines. A crankshaft cutting machine and a magneting marking machine deserve mentioning. The former is an adaptation of the principle of the so-called Moll crankpin turning machine to the machining of crank arms. Both are the work of the same designer. One or more crank arms can be accurately machined in one operation and one setting. The essential part is a ring, carrying the tool inside and through which the work is passed. This ring has two three movements: a longitudinal one for the feed, a traverse for planing the level sides of the arms, and a swivel movement for the round faces. The latter two movements alternate automatically. The length of the traverse can be adjusted to the required dimension. The cutting edge of the tool thus completely circumscribes the outline of the crank arm. For cutting the round faces the ring makes a half revolution while the traverse is at rest. If an elliptical shaped arm is desired the ring rotates continuously while the traverse stops, as before, at the end of each stroke sufficiently long for the ring to make one-half turn.

The marking machine has a magnetic plate capable of securely holding work up to 50 kg. in an upright position. This plate is carried on a horizontal shaft in a column. In this way it can be adjusted to any desired angle around its horizontal axis, and by means of a knuckle-joint, also in a range of 180 deg. around its vertical axis. For adjustment, dials with verniers are provided. The firm is also making a hydraulic testing machine which occupies but little space, meant for toolrooms, but of sufficient capacity for all ordinary requirements in machine building. It is noticeable that Krause & Co. are now following the lead of the two Schütte firms, becoming more and more manufacturers, which testifies to the difficult position of German machine tool dealers.

Single Purpose Tools

The copying of American designs has made no further progress, as far as could be seen. A prominent feature of German machine tool building is the marked increase of single-purpose tools and of automatic machines. A fair number of firms have thrown overboard all other lines and are now making automatics only.

A considerable expansion is also noticeable in the building of grinding machines. Except perhaps one of the grinding motors of Schmaltz, remarkable for its flatness as the whole motor has only 3½ in. width, nothing novel could, however, be discovered in this field. Schmaltz is building a whole line of grinding machines for large shafts and cylinders, chiefly for locomotive works, in which the grinding motor has a planet movement round the outside or inside surface of the work.

The business transacted at the machine tool exhibition was exceedingly small. Only for specialties have actual orders been received. The trans-

port of the tools exhibited is reported to have cost 1,000 million marks one way only. The sales concluded will probably amount to hardly more than one-half of this outlay.

The level of prices, the uncertain future and the blockade of the Rhineland and the Ruhr, forcing manufacturers to retrenchment and precaution, are held responsible for this negative result. Prices have now reached a level of from 6,000 to 10,000 times pre-war prices—much nearer the latter than the former figure—which at the present mark rate corresponds with a doubling of pre-war prices. For export, prices were heard that in all cases were below domestic prices. This state of affairs, which means a genuine dumping practice is no doubt untenable. Wages are still on the upward move. No reduction of prices can be expected from this direction. The only relief could come of a lowering of coal prices and freight rates which might reduce prices of the basic materials. This is, however, not at all assured because prices are lastly determined by the relations of supply and demand which are now since the blockade of the chief sources of supply, not to speak of all the other adverse factors, very much in disfavor of healthier conditions.

Trade Catalogs

Vertical Drilling-Machine. The Superior Machine Tool Co., Kokomo, Ind. A four page folder, mostly illustrations, has recently been issued by this company. The 20 in. "Superior" drilling-machines in various styles are shown and described with specifications.

Portable Electric Drills and Reamers. The Hisey-Wolf Machine Co., Cincinnati, Ohio. Bulletin No. 106, describing the many different drills and reamers made by this company has recently been issued. Besides these two main lines are also described attachments and accessories such as handles, breast plates, chucks and stands.

Cranes. The Whitney Corp., Harvey, Ill. A very attractively arranged and printed book with a heavy paper cover and containing eighty-eight 6x9 in. pages has been issued by this concern and is being distributed upon request. Electric traveling cranes, bucket-handling cranes, gantry cranes, transfer cranes, handpower cranes, jib cranes, pillar and bracket cranes, lifting attachments, railways specialties and clearance tables are illustrated and described in the book. It is perforated on the left hand side, making it convenient for filing.

Electric Pyrometers. The Brown Instrument Co., Wayne Junction, Philadelphia, Pa. A striking folder of six narrow pages shows the different uses of the concern's product and various well known corporations that use them are listed.

Tools. The Brown & Sharpe Manufacturing Co., Providence, R. I. A booklet which is described as a supplement to Catalog No. 28 issued by this company, has recently been circulated. It contains a variety of tools that are useful in the machine shop and garage. Micrometers, calipers, rules, gages, speed indicators and other tools are illustrated and described.

Automatic Auto-Starters. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The type AF automatic auto-starters for polyphase squirrel cage induction motors are shown in an attractive four page folder that has been issued by this company.

Squirrel-Cage Induction Motors. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The type CS large squirrel-cage induction motors are shown in a four page folder recently issued by this company. Illustrations of the motors and descriptions of their various uses are to be found in the folder.

Control Switches. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Type CS control switches with their application, construction and advantages are described in a recently circulated four page folder. Illustrations and specifications are also used.

Circuit-Breakers. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Type F-10 oil circuit breakers are described in a folder issued by the company. Illustrations and charts are used to emphasize their value.

Drawing Instruments. Golden Compass Co., Elkhart Ind. Two new folders have been mailed out to the trade by this company in which all sorts of T squares and rules are described as well as other instruments used by draftsmen, engineers and students.

Dust Collectors. J. W. Paxson Co., Philadelphia, Pa. The problem of ridding the workroom of fine dust and particles of metal is discussed in a new folder issued by the company. It shows that greater efficiency may be obtained in a dustless room.

Dial Indicators and Gages. The Federal Products Corp., Providence, R. I. Various models of dial indicators, thickness gages, testing gages, dial comparators and other products of this concern are shown in a new catalog that has recently been issued. The cover is in light blue and the pages are 8½x11 in. in size.

Multi-Purpose Machine. Triplex Machine Tool Corp., New York City. A machine that does turning, milling and drilling is described in a four page folder issued by this company. The machine is also illustrated showing the methods by which the different operations may be accomplished.

Gears. Boston Gear Works, Norfolk Downs, Quincy, Mass. Catalog No. 42 containing tables, specifications, descriptive matter and illustrations pertaining to various gear products of this concern has just been issued. The catalog is in a handy pocket size and contains one hundred and ninety-two pages and cover.

Battery Charging Equipment. Hobart Brothers Co., Troy, Ohio. Several four page folders describing the product made by this company have recently been issued. Various types for different sized shops are shown.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

All automobile parts that enter into the construction of a motor car. England. Purchase from manufacturers. Quotations, c.i.f. Liverpool or Manchester. Terms, cash against documents. Reference No. 6041.

Flexible transmission shafts and tubes of steel and accessories. Italy. Purchase. Quotations, c.i.f. Genoa. Terms, cash against documents. Reference No. 6043.

Steel rails and fishplates, 3,000 tons. Norway. Purchase. Reference No. 6045.

Small engines for motor boats. Italy. Agency. Quotations c.i.f. Italian port. Terms, cash against documents. Correspondence, French or Italian. Reference No. 6048.

Small vulcanizing outfits and automobile accessories. Italy. Purchase or agency. Quotations, c.i.f. Italian port. Terms, cash against documents. Correspondence, Italian. Reference No. 6049.

Printing presses and machinery generally, bookbinding machinery and equipment. Mexico. Purchase. Quotations, f.o.b. Mexican destination. Correspondence, Spanish. Reference No. 6054.

Complete cement-making plant of 1,000-barrel capacity for making Portland cement. China. Purchase. Reference No. 6055.

Machinery of all kinds and supplies. New Zealand. Representation by merchant who will shortly visit the United States. Catalogs and full particulars desired. Reference No. 6056.

Machinery and supplies for the opening of a newly discovered coal mine. Portuguese East Africa. Purchase. Quotations, c.i.f. African port. Catalogs are requested. Reference No. 6057.

Full equipment for graphite mill in Madagascar. France. Purchase. Quotations, c.i.f. Madagascar. Terms, Bank credit to be arranged. Reference No. 6058.

Machinery for the filling and weighing of oatmeal in paper boxes. Norway. Purchase. Reference No. 6059.

Machines to cast small parts of delicate apparatus of all kinds, such as small motor wheels, frames of mechanical appliances, gear parts and small parts of precision instruments. France. Purchase. Correspondence, French. Reference No. 6060.

Machinery and equipment necessary for the manufacture of porcelain. Porto Rico. Purchase. Catalogs and full descriptions are desired. Reference No. 6061.

Mining machinery, such as small aerial tramways, compressor plants, concentrators, and general mining and milling machinery required for opening up, developing and preparing ore for shipment. Canada. Agency. Quotations, c.i.f. Canadian port. Reference No. 6062.

Paper-making machinery for a paper mill using sabai grass. India. Specifications and catalogs are desired. Reference No. 6063.

Air compressors, pneumatic drills and hammers, and apparatus for sand blast. Italy. Agency. Catalogs requested. Correspondence in French or Italian. Reference No. 6064.

Cane-sugar machinery for plantations and small mill uses. Guadeloupe. Purchase. Catalogs and correspondence should be in French. Reference No. 6065.

Mine supplies of all kinds including mining machinery, belting, metals, lubricants and tools. South Africa. Exclusive agency. Quotations, f.o.b. New York. Terms, payment in New York. Reference No. 6066.

Machinery for making soap from cocoanut oils. East Africa. Purchase. Quotations c.i.f. Mombasa. Terms, cash against documents. Reference No. 6067.

Forthcoming Meetings

American Welding Society, annual meeting. Engineers' Building, New York City, April 24 to 27.

National Foreign Trade Council. Annual meeting at the Grunewald Hotel, New Orleans, La., May 2, 3 and 4, 1923. O. K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association. Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Chamber of Commerce. Annual meeting, New York City, May 7 to 10. Julius Barnes, president.

American Association of Engineers. Annual convention, Norfolk, Va., May 7 to 9. C. E. Drayer, 63 East Adams St., Chicago, Ill., secretary.

National Association of Manufacturers. Annual convention, Waldorf-Astoria Hotel, New York City, May 14-15-16. General offices, 50 Church St., New York City.

National Association of Purchasing Agents. Annual convention, Cleveland, May 15 to 18. H. R. Heydon, 19 Park Place, New York City, secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society of Mechanical Engineers. Spring meeting at Montreal, Can., May 28 to 31. Calvin W. Rice, 29 W. 39th St., New York City.

American Society for Testing Materials. Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., June 14 and 15. Hotel reservations through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Steel plates not under $2.75 per 100 lb., Pittsburgh, for spot deliveries in the open market. As high as $2.90 named on some shipments. Quotations of $2.45 still hold for railway car orders in substantial tonnages. Considerable inquiry for steel plates at mills, mostly for car building. Structurals, $2.50@$2.65; increasingly difficult to place orders at $2.45. Steel bars, $2.35@$2.75. Wrought-steel pipe discounts down two points on Pittsburgh basing card of April 19, change reflected in New York warehouses. Red and white lead, both dry and in oil, advanced ¼c. per lb., f.o.b. New York.

Declines—Lead and zinc down ¼c.; tin, 2c. per lb. in New York warehouses. Antimony also cheaper. Decline in lead due to heavy imports. Iron and steel scrap and spot coke prices lower. Iron prices firm, however, despite dullness of market.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	32.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.94
BIRMINGHAM	
No. 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	33.76
Virginia No. 2	34.17
Basic	30.75
Grey Forge	31 00
CHICAGO	
No. 2 Foundry local	33.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	32.00
Basic	31.00
Bessemer	31.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.0
Cleveland	5½@6¼
Cincinnati	4@6
New York	5½@5¾
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.65@3.25	4.34	3.90	4.15
No. 12	2.75@3.35	4.39	3.95	4.20
No. 14	2.85@3.45	4.44	4.00	4.25
No. 16	3.05@3.65	4.54	4.10	4.35
Black				
Nos. 17 and 21.	3.35@3.85	4.70	4.55	4.85
Nos. 22 and 24.	3.40@3.90	4.75	4.60	4.85
Nos. 25 and 26.	3.45@3.95	4.80	4.65	4.90
No. 28	3.50@4.00	4.90	4.75	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00@4.50	4.90	4.80	5.10
Nos. 12 and 14.	4.10@4.60	5.00	4.90	5.2
Nos. 17 and 21.	4.40@4.90	5.30	5.20	....
Nos. 22 and 24.	4.55@5.05	5.45	5.35	5.65
No. 26	4.70@5.20	5.60	5.60	5 80
No. 28	5.00@5.50	5.90	5.90	6.10

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
1 to 3	62	50½	⅜ to 1¼	30	13
LAP WELD					
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 to 8	56	43½	4½ to 6	28	13
9 to 12	54	41½	7 to 12	26	11
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1¼	60	49½	¾ to 1¼	30	14
2 to 3	61	50½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 to 8	52	39½	7 to 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

WROUGHT PIPE—Warehouse discounts as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded.	52%	39%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded.	49%	36%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 10%. Cast iron, standard sizes, 21½% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.69	4.51	4.55
Cold rolled strip steel	7.00	8.25	7.25
Floor plates	5.65	5.46	5.80
Cold finished shafting or screw	4.20	3.90	4.30
Cold finished flats, squares	4.70	4.40	4.80
Structural shapes (base)	3.44	3.31	3.30
Soft steel bars (base)	3.34	3.21	3.22½
Soft steel bar shapes (base)	3.34	3.21	3.22½
Soft steel bands (base)	4.14	3.61	3.95
Tank plates (base)	3.44	3.31	3.30
Bar iron (3.25 at mill)	3.34	2.91	2.92½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
5/32	8.50		14.00
⅛	7.35		12.25
11/32 to ¼	7.10		11.00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			17.75
Tin, 5-ton lots, New York			45.50
Lead (up to carlots), St. Louis	8.00;	New York.	8 47½
Zinc (up to carlots), St. Louis	7.25;	New York.	7.70

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	28.00	28.50
Antimony (Chinese), ton spot	9.37½	11.50	10.50
Copper sheets, base	26.50	25.75	23.00
Copper wire (l.c.l.)	19.87½	22.00	16.25
Copper bars (l.c.l.)	23.75	25.25	19.50
Copper tubing (l.c.l.)	28.00	30.25	23.00
Brass sheets (l.c.l.)	21 75	25.25	18.75
Brass tubing (l.c.l.)	26.50	30.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (l. c. l.)	20.00	21.00	15.75
Brass wire (l. c. l.)	22.25	22.00	.....
Zinc sheets (casks)	11.00	11.25	.....
Solder (½ and ½), (caselots)	33.00	32.00@34.00	20.00
Babbitt metal (83% tin)	65.00	58.00	36.00
Babbitt metal (35% tin)	40.00	18.50	.....
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	14.75@15.25	14.00	15.50
Copper, heavy, and wire	14.50@15.00	13.50	14.50
Copper, light, and bottoms	12.50@13.00	12.00	13.50
Lead, heavy	6.25@ 6.75	6.50	7.25
Lead, tea	5.75@ 6.00	5.00	6.25
Brass, heavy, yellow	8.75@ 9.00	....	9.25
Brass, heavy, red	12.25@12.75	12.00	12.50
Brass, light	7.25@ 7.75	7 50	8 25
No. 1 yellow brass turnings	8.75@ 9.00	8.50	9.00
Zinc	5 00@ 5.50	4.50	4.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	22.00	18.25	18.50
IX,	20x28, 112 sheets	24.50	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	19.50	16.00	17.00
IX,	20x28, 112 sheets	22.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	13.00	12.20	14.50
IC,	112 sheets	13.30	12.60	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.30	7.25
IC,	14x20	7.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11½
Cotton waste, colored, per lb.	.07@.12	.12	.08
Wiping cloths, 13½x13½, per lb.	.11@.11½	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	3.50	2.65
Roll sulphur, per 100 lb.	2.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.16	1.10	1.25
White lead, dry or in oil	100 lb. kegs.	New York,	14.50
Red lead, dry	100 lb. kegs.	New York,	14.50
Red lead, in oil	100 lb. kegs.	New York,	16.00
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$7.25@7.75	
Coke, prompt foundry, Connellsville	per net ton	7.75@8.25	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅞ and smaller	60%	.....	.....
Semi-finished nuts, ¾ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, ½ in. dia. and smaller	40%	50-10%	50%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ⅝-in., ¾-in., 1x2 in. to 5 in., per 100 lb (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1¼ to 1½-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ark., Mammoth Spring—W. O. Ellis, Box 216 (garage)—power drill press, lathe, emery stand, belting, hangers, bearings, shafting, pulleys and hand tools.

Conn., Bridgeport—Bullard Machine Tool Co., Brewster St. and Canfield Ave.—alligator shears.

Ill., Chicago—Almira Iron Wks., 1823 North Spaulding Ave.—combination or individual punches and one cold saw.

Ill., Chicago—Amer. Coil Spring Co., 1455 West 37th St.—6 x 16 in. lathe, drill press and saw, all for power attachment.

Ind., Goshen—Western Rubber Co.—foot power punches and shears.

Ind., Huntington—Armstrong Steel Casting Co.—alligator shears, 18 in. blade (used preferred).

Ind., Vincennes — Blackford Window Glass Co.—machine shop equipment and glass manufacturing machinery.

Kan., Baxter Springs—Price Motor Co., H. W. Price, Purch Agt.—electric power machine for cylinder grinding, also reamer.

Kan., Baxter Springs—Studebaker Garage—automobile reboring machine.

Kan., Burrton—Palace Garage, R. Moore, Purch. Agt.—power lathe, (used preferred).

Kan., Hutchinson—J. Baker, 518 South Main St.—power lathe for garage.

Kan., Hutchinson—G. White & Son, 707 South Main St. (machine shop) — quick change lathe (used).

Kan., Wichita—Auto Repairing & Machine Wks., 618 East Murdock Ave., B. M. Dawson, Purch. Agt.—power drill press for garage (used preferred).

Kan., Wichita—F. Kennedy, Murdock and Emporia Sts. (garage)—power drill press, emery stand and power lathe.

Kan., Wichita—McNeil & Near, 1214 East Douglas Ave. (garage), M. McNeil, Purch. Agt.—power drill press, lathe, emery stand, belting and hangers.

Kan., Wichita—I. Scott Garage, 1459 South Lawrence St.—power drill press, power lathe, emery stand, belting and hangers, (used preferred).

Mass., Boston — Fenway Garage, 923 Washington St., address manager—small tools, including drills and reamers, also belting, shafting, etc.

Mass., Boston — Huntley's Garage, 66 Chardon St., D. W. Huntley, Mgr.—small tools, drills, reamers, punches, cutters and accessories.

Mich., Detroit—Hanney Stamping Wks., 3104 East Woodbridge St.—one punch press, backgeared, shunt height, 3 in. stroke.

Mich., Detroit—Interstate Mchy. Co., 901 Guaranty Trust Bldg.—miscellaneous machine tools or entire machine equipment of light manufacturing plant (used).

Mich., Detroit—Peerless Tool Co., 1498 23rd St.—machine shop equipment.

Mich., Saginaw—Miles Mchy. Co.—Gordon cutting off machine and 36 in. throat punch with architectural jaw, 1 or 1¼ in. capacity.

Mo., Kansas City—Parker Garage, 9 North National Ave., M. Parker, Purch. Agt.—automatic, boring and tapping machines.

Mo., St. Louis—Killark Electric Mfg. Co., 3940 Easton Ave. (manufacturer of electric fuses), M. Desloge, Secy.-Treas.—electric drill, 110 volt a.c. ½ in. capacity.

Mo., St. Louis — Moerschell Electric & Auto Supply Co., 2944 Locust St., W. E. Moerschell, Pres.—14 in. machinists lathe.

N. J., Harrison—Driver-Harris Co. (resistant wire and alloys), E. A. Harleman, Purch. Agt.—one alligator shears, low knife type, 24 in. blade, capacity 4 in., round and square bars.

N. Y., Avoca—A. Eckler Co. (garage and machine shop)—20 in. back geared engine lathe (new or used).

N. Y., Batavia—H. D. Hampton, Ellicott St.—machinery and equipment for addition to repair shop.

N. Y., Buffalo—J. A. Carr, 1870 Bailey Ave.—gasoline and service station equipment, including 1,000 gal. tank.

N. Y., Carthage — R. Jackson Co., c/o Van Slyke's Garage—one 20 in. vertical single spindle drill.

N. Y., Jamestown — Crescent Tool Co., Harrison St. and Foote Ave. (manufacturer of wrenches) — trimming machinery and equipment for $7,500 addition to plant.

N. Y., Jamestown—Six Hundred Gas Stations, Inc., West 8th St.—machinery, tools and equipment for gasoline and service station on North Main St. and Fluvanna Ave.

N. Y., Malone—H. S. Day—machine shop equipment.

N. Y., Natural Bridge—L. Prettie & Co. (blacksmith, forge shop and repairs) — power operated metal saw, capacity 4 in.

N. Y., New York—Federal Equipment & Supply Co., 110 West 40th St.—one 9 x 9 and one 12 x 12 Peerless hacksaw machine.

N. Y., New York—Victor Mchy. Exch., 253 Centre St.—two Bliss or V. and O. presses.

N. Y., North Creek—Alexander Bros.—drill press, lathe, shaper and air compressor for new garage and repair shop.

N. Y., Utica—Hand & Graney Tire & Rubber Co., 101 Liberty St. (vulcanizing plant), P. C. Graney, Purch. Agt.—20 in. x 6 ft. or longer engine lathe for mounting wire brushes to score rubber.

N. Y., Utica—M. K. Welding & Brazing Co., 1202 Bleecker St. (welding, brazing and forge shop)—one 350 to 400 lb. drop hammer.

N. Y., Watertown — Kinney-Thompson Electric Co., 560 State St.—toolmakers lathe.

N. Y., Watertown—Taggart Bros. Paper Co., West Main St., J. Taggart, Purch. Agt. —1,200 lb. beating engine, later list of tools for machine shop.

N. Y., Watertown — Watertown Transportation Co., Inc., Haley St. (bus line), W. Gould, Purch. Agt.—20 x 96 in. plain cylindrical grinder.

O., Bridgeport—M. McConnoughy, Main St.—machinery, tools and equipment, including grinding machinery, etc., for garage and repair shop.

O., Cleveland—Central Brass Mfg. Co., 6203 Cedar St.—four No. 23 and four No. 33 New Britain automatic chucking machines (used).

O., Cleveland—Cleveland Wire Cloth & Mfg. Co., 3573 East 78th St.—one power square shear, 48 to 60 in., with about 12 in. gap, ¼ ft. capacity (used).

O., Dayton—W. H. Lau Co., 120 East 3rd St.—plating plant, including 200 amp. dynamo and 5 rheostats (used).

O., East Liverpool—Patterson Fdry. & Machine Co.—4, 6 and 8 ft. vertical boring mills; 4 ft. full Universal radial drill; 60 in. x 18 ft., 48 in. x 18 ft., 30 in. x 12 ft. and 18 in. x 10 ft. Le Blonde engine lathes; No. 4 Le Blonde plain H. D. milling machine; Universal cutter grinder; 20 in. back geared shaper; vertical 2 cylinder air compressor; 15 ton 40 ft. span electric crane.

O., Warren—Salzenbacker Motor Co., Inc.—machinery, tools and equipment for garage and repair shop.

Okla., Picher—Amer. Machine Wks., Box 1707, F. S. Scott, Purch. Agt.—lathe chuck, 12 x 14 in., four jawed, independent; small electric drill, 12 in. long or less; portable electric grinder, 110 volt, 25 cycle.

Okla., Picher—Picher Welding Co., 116 Connell Ave.—electric grinding machine.

Okla., Picher—Wise & Wyrick Welding Wks., H. L. Wyrick, Purch. Agt.—drill press, air compressor, later, taps, dies and reamers.

Pa., Carnegie—Union Electric Steel Co.—machine tools.

Pa., Greenwald—Amerag Co., A. M. Greenwald, Vice Pres. — machinery and equipment, including forge and machine shop equipment, for proposed large plant for the manufacture of farm tractors.

Pa., Leola—H. M. Stauffer & Son (sheet metal works)—30 in. squaring shears, No. 30 variety woodworker and 6 ft. cornice breaker.

Pa., Meadville—M. Mercatoris & Son—machinery, tools and equipment, including air pumps for gasoline and service station on North St. and Earl Ave.

Pa., Phila. — Eng. Tool Corp., 1434 Brandywine St.—No. 1 and 2 No. ton universal grinders.

Pa., Pittsburgh—Union R. R. Co., Union Arcade, W. A. Parker, Purch. Agt.—axle lathe and car wheel borer.

Pa., Reading—Brown Eng. Co., 130 North 3rd St. (friction clutches)—one No. 36 B Gould & Eberhard and one No. 13 H Brown & Sharpe spur and beveled gear cutter.

Pa., Warren—J. Callahan, Market St. Ext.—complete gasoline and service station equipment, including air compressor outfit, etc.

Tex., Dallas—J. W. Davis, 2810 Elm St. —punch press and milling machine.

Wash., Spokane — Western Cedar Pole Preservers, Peyton Bldg., O. C. Hansen, Pres.—machinery for sawing, handling, treating and storing poles, also machine tools for $100,000 plant at Yardley.

W. Va., Logan—Guyan Machine Shops, B. Shell, Purch. Agt.—lathe for turning locomotive wheels up to 33 in., gauges vary 32 to 56 in.; pulleys or drums for 36 in. belt, about 30 in. diam.; ⅛ x 3 x 4 in. angles; conveyors and conveyor fittings for handling run of mine coal, belts 36 and 42 in. wide, one conveyor 24 in. belt, 10 ft. center to center of pulleys.

W. Va., Norton—Virginia Coal & Coke Co.—machine shop equipment.

Wis., Ashland—Ashland Garage Co., 2nd Ave., East and 2nd St., R. E. Kamm, Proprietor—automobile repair machinery and small tools for proposed addition to garage.

Wis., Eau Claire—Hoveland Sheet Metal Wks., 205 West Madison St., A. Hoveland, Purch. Agt.—sheet metal machinery, including 8 ft. brake, bender, etc.

Wis., Hurley—Norman Motor Co., 51 3rd Ave., B. E. Norman, Pres.—automobile repair machinery, including press, gasoline storage tank and pump, for proposed $40,000 garage.

Wis., Keil—Hingess & Bessler Co., A. B. Bessler, Purch. Agt.—shop equipment, drill press and small tools.

Wis., Madison—University of Wisconsin, Administration Bldg., M. E. McCaffery, Secy.—shop equipment and small tools for proposed $83,000 addition to machine and metal shop.

Wis., Milwaukee—Amer. Tool & Production Co., c/o E. C. Rosenberg, 114 Grand Ave.—large and small drill presses, grinders and motors.

Wis., Waupun—Null & Gumbert, C. H. Gumbert, Purch. Agt.—lathes, milling machine, drill presses and small tools for repair shop (new and used).

Wis., Wauwatosa—E. Gissinger, 137 State St. (sheet metal works)—36 in. squaring shears and 8 in. brake.

Ont., Brockville—Gilbert Boat Co.—machine shop equipment, to replace that which was destroyed by fire.

Machinery Wanted

Ala., Tuscaloosa—Tuscaloosa Ry. & Facilities Co.—ice manufacturing and cold storage equipment for plant on 4th St.

Conn., Plainville—Peck Spring Co., 68 Broad St.—twenty-four automatic machines for proposed factory.

Ill., Chicago—Raymond Bros. Impact Pulverizer Co., 1319 North Branch St. (pulverizing machinery)—10 ton, 50 to 55 ft. span overhead electric traveling crane and motors for 220 volt, 3 phase, 60 cycle (used).

Ind., Butler—R. D. Higley (newspaper and job printer)—linotype, 2 revolution cylinder press, magazine folder, power paper cutter, stitcher, perforator and job press.

Ind., Indianapolis—Shott Mfg. Co., 1002 Kentucky Ave.—machinery and equipment for the manufacture of bed springs.

Ind., Marion—Upland Flint Glass Co.—glass making machinery and equipment.

Kan., Hutchinson—Hutchinson Auto Co., 800 South Main St. (garage)—one Universal saw.

Ky., Eddyville — Herald — 12 x 18 in. power job printing press.

Ky., Harrodsburg—Kiley's Print Shop—10 x 15 in. power job printing press.

La., Monroe — Pratt Lumber Co. — electrically operated sawmill machinery and equipment.

Md., Baltimore—Baltimore & Ohio R.R., Baltimore and Ohio Bldg., Charles and Baltimore Sts., W. S. Galloway, Purch. Agt.—six 42 in. and ten 48 in. belt conveyors for proposed grain elevator.

Md., Baltimore—B. E. Border, 21 West Saratoga St.—machinery for the manufacture of silk, cotton and woolen hosiery, underwear and neckties.

Md., Baltimore—Holtite Mfg. Co., Ostend and Warner Sts. (manufacturer of rubber heels), A. A. Esterson, Purch. Agt.—60 in. mill for rubber mixing (new).

Md., Baltimore—Porcelain Enamel & Mfg. Co., 8th Ave. and O'Donnell St., A. Krekel, Purch. Agt.—conveying systems and dump buckets of all sizes (new).

Mass., Belmont (Boston P. O.) — Bd. Educ.—lathes, drills, planers, matchers, sanders, benches and tables for vocational department of new school.

Mass., East Boston—Boston Stove Fdry. Co., 202 Border St., address manager — foundry equipment, forge, blower, conveying machinery, etc.

Mass., Holyoke — Judd Paper Co., 166 Race St.—paper making equipment for proposed $75,000 factory.

Mass., Norwood—School Com.—manual training equipment, including lathe, planer, matcher, drill, benches and tables, for new school.

Mich., Grand Rapids — Adzit Printers Supply Co., 41-43 Ellsworth St.—Miehle press.

Mich., Williamston—Williamston News—7 column folio newspaper press, one quarto press, linotype and intertype machines, also linograph.

Miss., Golden—Golden Gravel Co.—washing and screening machinery and equipment.

Mo., Kansas City—C. L. Reveal, 1722 Jackson St.—complete planing mill machinery, including saws, sander and planer.

Neb., Omaha—City Linotyping Co., 12th and Harney Sts. — five model 5 linotype magazines.

N. J., Newark—Woodside Mfg. Co., 210 Sylvan Ave. (textile shop)—48 spindle Payne or E & B doubling machine for braider bobbins.

N. Y., Canton—Barbour Bros. Harness Co., Hodskin St., E. Barbour, Purch. Agt.—power operated leather splitter and power shoe repair machine.

N. Y., Corning—W. R. Stevens—sanding machine, double saw trimmer and double surface planer, for sash and blind factory at Riverside.

N. Y., East Aurora—S. H. Peck & Son, Woodward Ave.—machinery and equipment for planing mill, to replace that which was destroyed by fire.

N. Y., Elmira—Elmira Water, Light & R. R. Co., F. H. Hill, Genl. Mgr.—automatic fuel handling equipment for proposed gas plant.

N. Y., Gardenville—Peerless Belting Co., E. F. Gingras, 389 Woodward Ave., Buffalo, Purch. Agt.—machinery and equipment for the manufacture of belting, to replace that which was destroyed by fire.

N. Y., Jamestown—H. A. Dailey, 847 Spring St.—complete tinshop equipment.

N. Y., Jamestown—Malrose Iron & Fuel Corp., Fluvanna Ave.—coal handling, also iron and steel scrap handling equipment.

N. Y., Jamestown — L. W. Russell, 15 West 2nd St.—1,000 lb. platform truck scales.

N. Y., Jamestown—Seaburg Mfg. Co., 124 Steele St., V. B. Seaburg, Vice Pres.—woodworking machinery and equipment for furniture plant, 100,000 sq.ft. of floor space.

N. Y., New York—Air Reduction Sales Co., 342 Madison Ave.—$100,000 worth of machinery and equipment for proposed gas plant at Sharon, Pa.

N. Y., New York—Natl. Electrotype Co., 229 West 28th St.—No. 2 New Britain chain mortiser.

N. Y., New York—Verplex Process Corp., 461 8th Ave.—one 350 ton hydraulic press, large platen, for pressing composition board; one 50 in. Seybold power paper cutter.

N. Y., Ontario—S. B. Huxley & Sons—machinery and equipment for canning plant.

N. Y., Rochester—Addison Lithographing Co., 59 South Ave.—lithographing and printing machinery for proposed $85,500 plant.

N. Y., Rochester — S. Raktovich, 689 Joseph Ave.—bakeshop equipment, including ovens.

N. Y., Rochester—G. A. Wenger, 12 Amherst St.—additional ice manufacturing machinery and equipment.

N. Y., Sacket Harbor—C. Gamble & Co. (lumber and millwork)—three saw edger.

N. Y., Utica—H. C. Taber & Sons Co., 1900 Bleecker St. (manufacturer of trunks), H. L. Taber, Secy.—wood veneer cutter and sanding machine.

N. Y., Watertown—James Inc., Factory St. (garage and machine shop), B. N. James, Purch. Agt.—pattern makers bandsaw with frame and table.

N. C., Burlington—A. D. Pate & Co. (job printer)—one 8 x 12 in. and two 12 x 18 in. job presses.

N. C., Swannanoa—Buncombe Co. Bd. Educ.—vocational equipment for $100,000 school.

N. C., Walkertown—Walkertown Chair Co.—woodworking machinery and equipment.

O., Akron—Interlocking Cord Tire Co.—tire building machinery and equipment for 2 unit plant addition.

O., Cincinnati—Hill & Griffith Co., 1262 State Ave.—machinery and equipment for $200,000 foundry, to replace that which was destroyed by fire.

O., Cincinnati—Perkins-Campbell Co., 624 Bway (textile shop)—machine for stripping cloth into narrow strips (new or used).

O., Columbus—Bee & Cee Bakery, 20 North High St., P. Brown, Purch. Agt.—complete equipment for bakery at 327 South Grant Ave.

O., Columbus—Columbus Lithograph Co., 214 North 4th St., J. Van Nostrand, Genl. Mgr.—equipment to enlarge plant.

O., Columbus—Furman Iron & Coal Co., 302 West Broad St., C. H. Furman, Mgr.—loading and unloading machinery for proposed retail coal yard on Frankfort and Bank Sts.

O., London—London Grave Vault Co., H. S. Iliff, Mgr.—equipment, including metal working machinery, for factory for the manufacture of grave vaults.

Okla., Cushing—J. G. Williams—newspaper press, power job press, belting, hangers, pulleys and bearings (used preferred).

Okla., Guthrie — Christian Triumph — mailer, power job press for book printing, power paper cutter and wire stitcher.

Okla., Tulsa—Printers Exch., 2623 5th Pl.—job printing press, power paper cutter and army press.

Pa., Coplay—L. Geist—brick making equipment, cement products making and concrete block working machinery.

Pa., Dupont (Avoca P. O.)—Dupont Silk Co.—two No. 50 Universal copping machines.

Pa., Easton — Bd. Educ. — vocational equipment for $175,000 school.

Pa., Erie—Erie Residence Roofing Co., East 18th St.—machinery and equipment for new roofing plant.

Pa., Irwin—Irwin Planing Mill, Lincoln Highway, R. S. Altman, Mgr.—pulleys, hangers, shafting, rip saw, planer and bandsaw.

Pa., Jermyn—R. M. Roderick—iron working machinery and equipment for the manufacture of patented potato masher.

Pa., Lewiston—Mifflin Sand Co., S. B. Russell, Secy.—sand bank machinery.

Pa., Lititz—The Grade, Drawer 339 (newspaper and job printer)—Kelly press, one linograph, one linotype and one grimsaw machine, also 19 in power paper cutter and multiple punch.

Pa., Oakmont—Edgewater Steel Co.—one monorail crane.

Pa., Phila. — Pennsylvania R.R., Broad St. Sta., S. Porcher, Genl. Purch. Agt.—three 5 ton single I beam cranes.

Pa., Pittsburgh—Bessemer & Lake Erie R. R., Union Arcade, W. A. Parker, Purch. Agt.—mechanical equipment for proposed freight house at Erie.

Pa., Pittsburgh—The Observer, Box 598—intertype machine, model B.

Pa., Pittsburgh—West Penn Power Co., West Penn Power Bldg.—one bucket trolley.

Pa., Scranton—Lackawanna Valley Fuel Co., 715 Capouse Ave.—coal washing machinery and equipment, to replace that which was destroyed by fire.

Pa., Scranton—Mutual Silk Throwing Co., 614 Wyoming Ave.—silk loom and spinning machinery.

Pa., Somerset—R. Walker (garage)—air compression machine, also gas and oil pumps.

Pa., Uniontown—Richmond Radiator Co.—enameling plant machinery and equipment.

Pa., Warren—Jacobson Gas Engine Co., F. S. Lanning, Dir.—machinery and equipment for proposed gas engine plant at Titusville.

R. I., Providence—Hennessy Mill Supply Corp., P. O. Box 450—brading machines, all numbers from 8 carrier to 44 carrier.

S. C., Beaufort — Bd. Educ. — vocational equipment for $100,000 school.

Tenn., Knoxville—White Oak Corp., Box 1094—woodworking machinery, including rip and circular saws, jointer, planer, etc.

Tenn., Rockwood—Rockwood Stove Wks., H. Howard, Mgr.—equipment for 1 story foundry.

Tex., Comfort—Printer, Box 225—30 and 36 in. bar folder, 42 in. pipe folder and other printing equipment.

Tex., Dallas—Rex Mfg. Co., 1101 Ross Ave.—wood lathe with power attachment.

W. Va., Charleston — Dewey Furniture Co., Pennsylvania St.—woodworking machinery for proposed $100,000 factory, to replace that which was destroyed by fire.

Wis., Algoma—E. Waedke (grist mill)—grain grinding and crushing machinery, also shifters, all belt driven.

Wis., Chippewa Falls — Tschopp-Durch-Camastral Co., Columbia and High Sts. (contractors) — hoisting machinery and equipment for dry kiln, 10,000 ft. lumber capacity.

Wis., Evergreen—G. Greenfield—machinery, including power churns, testers, refrigeration machinery, etc., for proposed creamery.

Wis., Kohler — Kohler Co. (enameled ware), A. P. Freick, Purch. Agt.—crushing, grinding and other machinery for the preparation of enamel.

Wis., La Crosse—Weisel Mfg. Co.—woodworking tools with individual electric motor drive, belting and shafting.

Wis., London—Bd. Educ., E. Albrecht, Clk.—manual training equipment and small tools for proposed grade and high school.

Wis., Milwaukee—A. F. Abraham, 1173 26th Ave. (woodwork)—8 in. sticker.

Wis., Milwaukee—W. W. Oeflein, Inc., 86 Michigan St. (contractor)—one portable saw rig, gasoline engine power.

Wis., Milwaukee—A. J. Pietsch, 35th and State Sts. (woodwork)—one large saw table.

Wis., Milwaukee—A. N. Strack, 744 57th St. (woodwork)—boring machine to bore two holes at one time.

Wis., Nekoosa—G. E. Gazely—machinery, including churns, testers, etc. for creamery at Arpin.

Wis., Ripon—A. A. Brown—special machinery for the manufacture of washing machines, also power machinery and small tools.

Wis., Sheboygan—Ebenreiter Lumber Co., 1215 Erie Ave., R. Ebenreiter, Mgr.—woodworking and power machinery for proposed $40,000 factory.

Wis., Superior—C. W. Edwardson, 1314 North 5th St.—400 loaf oven, mixers and electrically operated special machinery for bakery.

N. B., Port Elgin—T. Taylor—complete equipment, including dovetailer and bandsaw for sawmill at Brooklyn siding.

Ont., Hamilton—H. McCann, 158 Wilson St.—one Mussle electric furnace, 8 x 12 x 19, 25 cycle, 110 volt.

Ont., Simcoe—Wilkey Products Co., L. C. Gibson, Pres.—machinery and equipment for $125,000 factory for the manufacture of specialties.

Ont., Sudbury—Allied Footwear Co. of Canada, W. McDonald, Purch. Agt.—complete equipment for the manufacture of shoes, etc.

Que., Montreal—Gates Eng. Co., Ltd., 382 St. James St., E. T. Jeffery, Purch. Agt.—machinery and equipment for the manufacture of fire bricks, locomotives blocks, stove lining, terra cotta, etc.

Que., Montreal—Paramount Rubber Co., Ltd., 17 St. John St., T. B. Birchall, Purch. Agt.—complete machinery and equipment.

Que., St. Michel Des Saints—L. J. Menard—traveling carriage saw, drum saw, shingle saw, shaper, electrical equipment, etc., for sawmill.

Que., Glenada — T. Juneau — complete equipment for sawmill.

Metal Working Shops

Calif., Fresno—The Durant-Steeves Motor Co. awarded the contract for the construction of a 1 story garage on Van Ness St. Estimated cost $40,000.

Calif., Los Angeles—The Kleiber Motor Truck Co., 1938 South Main St., awarded the contract for the construction of a 1 story factory on Santa Fe and 24th St. Estimated cost $85,000.

Calif., Los Angeles—The Standard Auto Body Co., 1501 Central Ave., will build a 2 story, 50 x 150 ft. factory and shop.

Calif., Oakland—O'Brien Bros., Archts., 315 Montgomery St., San Francisco, are receiving bids for the construction of a 1 story garage on Adeline and 32nd Sts., here, for the L. R. Lurie Co., Mills Bldg., San Francisco. Estimated cost $40,000. Pacific Telephone & Telegraph Co., 333 Grant Ave., San Francisco, lessee.

Calif., San Francisco—J. Pasqualetti, Humboldt Bank Bldg., awarded the contract for the construction of a 2 story garage on Sacramento St. near Lyon St. Estimated cost $40,000.

Calif., Stockton—The Cowell Estate, 2 Market St., San Francisco, awarded the contract for the construction of a 1 story, 80 x 100 x 150 ft. garage on Channel and Hunter Sts. Estimated cost $50,000. W. H. George, Mgr. Noted Mar. 8.

Conn., Hartford—H. Bland, 521 Park St., is having plans prepared for the construction of a 1 story, 50 x 120 ft. garage. Estimated cost $40,000. Berenson & Moses, 50 Allyn St., Hartford, Archts.

Conn., Hartford—L. G. Carroll is having plans prepared for altering 3 story, 30 x 90 ft. store, office and garage building at 104 Trumbull St. Estimated cost $50,000. B. M. Sellew, 721 Main St., Hartford, Archt.

Conn., Hartford — S. Kaplan, Windsor Ave., is having plans prepared for the construction of a 2 story, 60 x 100 ft. garage. Estimated cost $40,000. F. C. Walz, Trumbull St., Hartford, Archt.

Conn., Meriden—L. Limon, 127 South Colony St., plans to build a 3 story, 70 x 130 ft. garage and storehouse at 13 Cherry St. Estimated cost $100,000. Engineer or architect not selected.

Conn., Plainville—The Peck Spring Co., 68 Broad St., is having plans prepared for the construction of a 2 story, 30 x 60 ft. factory. Estimated cost $40,000. Private plans.

Conn., Wallingford—The Dowd-Rodgers Co., Carlton St., manufacturer of silver plated ware, is having plans prepared for the construction of a 1 story, 40 x 120 ft. factory on Cherry St. Estimated cost $40,000. Private plans.

Kan., Fort Scott—L. De Stowolinska, Central Garage, is having preliminary plans prepared for the construction of a 1 story, 50 x 150 ft. garage. Estimated cost $45,000. Private plans.

Ky., La Grange—The Southern Signals Co. plans to build a plant for the manufacture of railroad signals. Estimated cost $50,000. Engineer or architect not selected.

Mass., Foxboro—The Foxboro Co. is having plans prepared for the construction of a 4 story, 50 x 160 ft. factory. Cost between $150,000 and $200,000. Marks & Johnson, 99 Chauncey St., Boston, Engrs. and Archts. Noted Mar. 29.

Mich., Big Rapids—Lane, Davenport & Peterson, Archts., 2330 Dime Bank Bldg., Detroit, are receiving bids and will open same about May 2 for the construction of a 1 story, 180 x 240 ft. garage and repair shop, here, for Turner, Crimmins & Water. Estimated cost $75,000. Noted Mar. 29.

Mich., Pontiac—The Fisher Body Corp., General Motors Bldg., Detroit, awarded the contract for the construction of two 1 story units and a 2 story, 150 x 500 ft. unit of automobile body plant on Baldwin Ave., here. Estimated cost $2,000,000.

Mo., Kansas City—The Bernard & Buchli Co., 4041 Bway, is having plans prepared for the construction of a 1 story, 65 x 130 ft. garage on Bway and Schaefer St. Estimated cost $40,000. E. C. Faris, 3908 Central St., Kansas City, Archt.

Mo., Kansas City—Busche & Klapmeyer, 2800 East 31st St., awarded the contract for the construction of a 2 story, 50 x 113 ft. sales and service station. Estimated cost $40,000. Noted Mar. 22.

Mo., St. Louis—The Liberty Fdry. Co., 7600 Vulcan St., awarded the contract for the construction of a 1 story, 75 x 100 ft. iron foundry on South 38th St. Estimated cost $10,000.

Mo., St. Louis—The St. Louis Heating Co., 2402 Coleman St., awarded the contract for the construction of a 1 story, 120 x 200 ft. furnace factory on University St. Estimated cost $35,000.

Mont., Great Falls—The Sunburst Refining Co., 1st Natl. Bank Bldg., plans to build an oil refinery with tanks for storage stills, machine shops, etc. Estimated cost $500,000. E. A. Wyatt, Genl. Mgr.

N. Y., Brooklyn—M. Rothschild, c/o E. M. Adelsohn, Engr. and Archt., 1778 Pitkin Ave., will build a 1 story, 100 x 200 ft. garage on Liberty Ave. Estimated cost $60,000.

N. D., Minot—K. Kulaas is having plans prepared for the construction of a 2 story, 80 x 150 ft. garage. Estimated cost $40,000. I. L. Rush, Minot, Archt.

O., Ashtabula—The Standard Oil Co. of Ohio, c/o E. B. Wagner, Supt. of Constr., East Ohio Gas Bldg., Cleveland, is receiving bids for the construction of a 1 story garage and warehouse, here. Estimated cost $40,000. Private plans.

O., Cincinnati—The Hill & Griffith Co., 1262 State Ave., plans to rebuild its 4 story foundry which was destroyed by fire. Estimated cost $200,000. Engineer or architect not announced.

O., Cleveland—Bash & Steverding, 12309 Phillips Ave., painting contractors, awarded the contract for the construction of a 1 story, 55 x 94 ft. garage at 609 East 140th St. Estimated cost $40,000.

O., Cleveland—The L. L. Carlozzi Co., 1258 East 105th St., Ford dealers, receiving bids for the construction of a 2 story, 101 x 120 ft. automobile sales station and garage on Ansel Rd. and Superior Ave. Estimated cost $150,000. W. S. Ferguson Co., 1900 Euclid Ave., Cleveland, Archts. Noted Mar. 8.

O., Cleveland — The Lake Erie Metal Products Co., c/o J. F. Strand, 4001 West 25th St., has had plans prepared for the construction of a 1 story factory on East 152nd St. near Bway. Estimated cost $50,000. J. Selasak, 6600 Park Ave., Cleveland, Archt.

Pa., Philadelphia—The Philadelphia Last & Pattern Co., 38th and Cuthbert Sts., awarded the contract for the construction of a 2 story, 52 x 105 ft. pattern shop. Estimated cost $100,000.

Pa., Pittsburgh—C. J. Allen, c/o City Deposit Bank, 6112 Penn Ave., awarded the contract for the construction of a 1 story, 175 x 296 ft. garage on Western Ave. Estimated cost $60,000. Noted Apr. 12.

Pa., Sharon—B. M. Freed, 44 South Dock St., awarded the contract for the construction of a 3 story garage, 60 ft. long. Estimated cost $40,000.

Pa., Wilkinsburg (Pittsburgh P. O.)—H. R. Heller, 231 South Euclid St., Pittsburgh, is receiving bids for the construction of a 1 story, 60 x 80 x 100 ft. garage on Johnston St., here. Estimated cost $40,000. Private plans.

O., Cleveland—The Natl. Screw & Tack Co., c/o F. G. Walker, Constr. Mgr., 2440 East 75th St., awarded the contract for concrete work on a 5 story, 56 x 165 ft. factory on Platt Ave. Estimated cost $250,000. Noted Dec. 28.

O., Cleveland—Paul Bros., c/o G. Paul, Fidelity Mortgage Bldg., are having plans prepared for the construction of a 1 and 2 story garage and service station on East 43rd St. and Windsor Ave. Estimated cost $150,000. J. F. Steffens, c/o owner, Archt.

O., Cleveland—The Power Improvement Co., c/o G. E. Peterson, 15924 Euclid Ave., awarded the contract for the construction of a 5 story, 109 x 135 ft. warehouse, sales and service station on Cedar Ave. and Ashland Rd. Estimated cost $250,000.

Pa., Erie—A. H. Murphy, 141 East 12th St., plans to build a 40 x 140 ft. addition to garage. Engineer or architect not announced.

Wis., Galesville—C. Klundred is having plans prepared for the construction of a 1 story, 40 x 80 ft. garage and automobile repair shop on Main St. Estimated cost $40,000. J. G. Schneider, Arcadia, Archt.

Wis., Madison—C. Rieder, 615 University Ave., awarded the contract for the construction of a 3 story, 50 x 65 ft. tire shop and service station. Estimated cost $50,000. Noted Feb. 1.

Wis., Medford—C. Flemming is having plans prepared for the construction of a 1 story, 50 x 95 ft. garage and repair shop. Estimated cost $40,000. J. G. Schneider, Arcadia, Archt.

Wis., Medford—The Frendle Bros. Co., c/o H. Grann, is having plans prepared for the construction of a 1 story, 50 x 100 ft. garage, repair shop and filling station on Main St. Estimated cost $40,000. J. G. Schneider, Arcadia, Archt.

Wis., Merrill—H. H. Juul is having plans prepared for the construction of a 1 story, 70 x 90 ft. garage and repair shop. Estimated cost $40,000. J. Bauman, Genesee St., Merrill, Archt.

Wis., Milwaukee—The Oneida Improvement Co., c/o T. Kerner, 214 Biddle St., is having revised plans prepared for the construction of a 2 story, 85 x 180 ft. garage on Front St. Estimated cost $100,000. Private plans. Noted Mar. 15.

Wis., Shawano—J. Popp is having plans prepared and will soon receive bids for the construction of a 2 story, 40 x 106 ft. addition to garage. Estimated cost $40,000. Private plans.

Wis., Wauwatosa — The Liberty Fdry. Co., 57th and State Sts., awarded the contract for the construction of a 1 story, 82 x 100 ft. addition to its foundry. Estimated cost $45,000.

For Additional Opportunities—

in the machinery field, be sure to consult the

SEARCHLIGHT SECTION

Every Week

You will find it in this issue—Pages 105 to 117